

MANAGEMENT OF THE DEPARTMENT OF DEFENSE

HEARING
BEFORE THE
COMMITTEE ON
GOVERNMENTAL AFFAIRS
UNITED STATES SENATE
NINETY-EIGHTH CONGRESS

SECOND SESSION

PART 8

COST ESTIMATING AND COST REPORTING IN DOD WEAPON PROGRAMS

MAY 24, 1984

Printed for the use of the Committee on Governmental Affairs



U.S. GOVERNMENT PRINTING OFFICE

36-744 O

WASHINGTON : 1984

5401-50

COMMITTEE ON GOVERNMENTAL AFFAIRS

WILLIAM V. ROTH, Jr., Delaware, *Chairman*

CHARLES H. PERCY, Illinois

TED STEVENS, Alaska

CHARLES McC. MATHIAS, Jr., Maryland

WILLIAM S. COHEN, Maine

DAVID DURENBERGER, Minnesota

WARREN B. RUDMAN, New Hampshire

JOHN C. DANFORTH, Missouri

THAD COCHRAN, Mississippi

WILLIAM L. ARMSTRONG, Colorado

THOMAS F. EAGLETON, Missouri

LAWTON CHILES, Florida

SAM NUNN, Georgia

JOHN GLENN, Ohio

JIM SASSER, Tennessee

CARL LEVIN, Michigan

JEFF BINGAMAN, New Mexico

DAVID PRYOR, Arkansas

JOAN M. McENTEE, *Staff Director and Chief Counsel*

C. LINCOLN HOEWING, *Professional Staff Member*

TOD P. HARING, *Professional Staff Member*

CHARLES D. WOEHRL, *Investigator*

IRA S. SHAPIRO, *Minority Staff Director and Chief Counsel*

TERRY JOLLY, *Chief Clerk*

CONTENTS

Opening statements:	Page
Senator Roth	1
Senator Pryor	12

WITNESSES

THURSDAY, MAY 24, 1984

Charles A. Bowsher, Comptroller General of the United States, General Accounting Office, accompanied by John L. Carter, GAO Evaluator, NSIAD/RDA & GP, Donald E. Day, Senior Associate Director, NSIAD/Special Project-Future Cost of Weapons Systems, and William W. Crocker, GAO Evaluator, NSIAD/DMTAG	4
John R. Quetsch, Principal Deputy Assistant Secretary, Assistant Secretary (Comptroller), Office of the Secretary of Defense; Maj. Gen. Melvin F. Chubb, Deputy Chief of Staff, System Development, Air Force Systems Command; Maj. Gen. James F. McCall, Comptroller, DARCOM, Department of the Army; and Everett Pyatt, Acting Assistant Secretary of the Navy for Shipbuilding and Logistics	64

ALPHABETICAL LIST OF WITNESSES

Bowsher, Charles A.:	
Testimony	4
Prepared statement with attachments	30
Carter, John L.: Testimony	4
Chubb, Maj. Gen. Melvin F.:	
Testimony	64
Prepared statement	105
Reponses to written questions submitted by Senator Roth	107
Crocker, William W.: Testimony	4
Day, Donald E.: Testimony	4
McCall, Maj. Gen. James F.:	
Testimony	64
Prepared statement	110
Reponses to written questions submitted by Senator Roth	112
Pyatt, Everett:	
Testimony	64
Prepared statement	118
Reponses to written questions submitted by Senator Roth	123
Quetsch, John R.:	
Testimony	64
Prepared statement	80
Reponses to written questions submitted by Senator Roth	102

ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD

"DOD Needs to Provide More Credible Weapon Systems Cost Estimates to the Congress," digest, GAO report, May 24, 1984	127
Committee chart showing program costs excluded from the December 1983 SARS	134

MANAGEMENT OF THE DEPARTMENT OF DEFENSE

THURSDAY, MAY 24, 1984

U.S. SENATE,
COMMITTEE ON GOVERNMENTAL AFFAIRS,
Washington, DC.

The committee met at 9:30 a.m., in room SD-342, Dirksen Senate Office Building, Hon. William V. Roth, Jr. (chairman of the committee) presiding.

Present: Senators Roth, Cohen, and Pryor.

OPENING STATEMENT OF SENATOR ROTH

Chairman ROTH. The committee will please be in order.

We convene today for a hearing on cost estimating and cost reporting in defense weapon programs. The principal purpose of holding the hearing today is to release a GAO report which I had requested some time ago to review the practices of cost estimating in the major defense weapon systems.¹ Very frankly, I think this report demonstrates clearly that the situation is appalling, and that none of us can be satisfied with where we are. I think it becomes obvious that some very basic institutional reform is critically necessary.

Now, there is some good news, and there is some bad news. The good news is that I think there is a growing awareness within the various services as to the deficiencies in the cost estimating process. It is a fact that they are beginning to institute reforms, and I find that to be a step forward, but very frankly, I am always concerned as to how effective these changes will be. This is not a new problem. The problem with cost estimating didn't start with the Reagan administration, it didn't start with the Carter administration, it didn't start with the Nixon-Ford administrations. It has existed for a long time.

The basic problem is that nothing has been done to correct it. Until we have some attitudinal reform, of which I think Congress has to bear a certain portion of the responsibility, the necessary changes are not going to be realized.

Just let me summarize what the findings of this GAO study are, by taking a statement out of your testimony, Mr. Bowsher, where you say, "On balance, today's military weapon systems acquisition process is characterized by programs which are extended, exceed

¹See p. 127 for a digest of the report.

original cost estimates, and encompass fewer units than originally planned."

I'm not going to steal all your thunder, but will let you proceed to spell out why the situation is appalling. Just let me point out that the findings show that of the 36 weapons analyzed by GAO, there is, on average, an \$18 million per month increase in the cost of each, \$18 million. The size of the problem is underscored by the fact that, based on past experience and GAO's findings that we have not made the institutional reforms that are necessary, we can anticipate the cost of weapons to exceed current DOD projections [F4DP 84-88] by a range of \$173 billion to \$324 billion; that is billion, not million. So it is a tremendous problem.

We all know that building and managing a complex weapon program is no piece of cake and that it is not simple to estimate. Sometimes I wonder, Mr. Bowsher, are we realistic in expecting a fixed ceiling, or should there be some kind of range? Can we really, on a realistic basis, come up with a single figure?

The reason why this is so important is that the figures that are given to Congress are the figures on which we base our decisions, and to the extent that they are inaccurate, our decisions are inaccurate. Frankly, I am concerned that cost estimates often seem to be little more than exercises which DOD must go through to get money from Congress. In effect, GAO found that the focus of the services and the program management is on the budget; on gaining as much funding as possible each year. Total estimated cost appears to be no constraint on cost growth, and cost estimates are infrequently used, apparently, in managing weapon systems.

Again, one of the questions that I am going to be interested in knowing your opinion on, Mr. Bowsher, is, why shouldn't there be a not-to-exceed cap, whatever the cost estimates? Then, if we exceed that, there could be a time for review, both by the Pentagon and the Congress. The objectives of the program offices often appear geared toward getting as much money as possible approved in the annual budget in order to buy as much as possible that year, and then postpone until future years further necessary purchases.

As I said, what really concerns me is that no one is really held to account for poor cost estimating practices or for excessive cost growth. In some cases, such as the LSD-41, a Navy ship, GAO had great difficulty in tracking cost data because of changes in cost estimating staff. This is too often true in the procurement picture. No one is held accountable: "It didn't happen on my watch," because there is too rapid a rotation of military personnel, lack of experience in well-trained program managers, and frankly, the failure to develop a professional career ladder for acquisition managers.

I believe we must change this situation, because the cost growth can only be brought under control by making people realize that their careers, their jobs depend on it. The procurement of weapons is not a military role but a business task. I have proposed that acquisition of major weapon programs be removed from service control and put under a central civilian acquisition agency, staffed by civilians who are well-trained, committed, experienced career professionals who are experts, experts in acquisition management.

I realize the idea is a major departure from the current situation, but I believe the cost growth problem is so serious and our acquisition system is in such poor condition that only by changing the basic system, by changing the attitudes and motivation of those managing weapon programs will we really make significant, lasting improvements.

[Senator Roth's prepared statement follows:]

PREPARED STATEMENT OF SENATOR WILLIAM V. ROTH, JR.

We convene today for a hearing to review the Defense Department's cost estimating and cost reporting procedures for major weapon programs. One of the focal points for our hearing today is a General Accounting Office report on cost estimating and reporting which I requested and am officially releasing today. I want to publicly commend the fine GAO auditors who worked on this very important but disturbing report.

After reading this GAO report, I can only say that I am truly concerned and outraged by what it reveals: Poor cost estimating procedures, faulty and unrealistic estimating assumptions and what appear to be at times misleading cost reports that are being developed and submitted by the Pentagon to Congress to justify spending for weapons.

The result of this mismanagement is that DOD's historic pattern of substantially underestimating weapons costs appears to be continuing and cost growth is as far from being under control as it has ever been. Although not included in its final report, GAO found that in five weapon systems it reviewed, total costs that DOD estimated would reach only \$44 billion may in fact actually exceed \$65 billion when all is said and done. Overall, we may wind up paying over \$300 billion more over the next 5 years for weaponry than DOD is currently estimating, according to GAO. The chart to my left on cost growth in DOD weapons programs in 1975, 1978 and 1983 indicates that the pattern of profusion in cost growth continues even today.

Let me make it clear at the outset that Congress has known there are problems with DOD cost estimates for many years and has not pressed as hard as it should have for improvements. But the fact remains that Congress cannot directly manage weapon programs and has entrusted the Defense Department with that responsibility. If the GAO's study is at all representative, I have some real concerns that the Department may not be effectively fulfilling its responsibility to fully and accurately report to Congress on the costs of weapon programs. We may be "legislating blind" because we are not getting the information we need to make completely informed judgements.

I have been in strong agreement with those who say we must rebuild our defensive capabilities. However, I don't think the effort to strengthen our national defense can long continue without the support of the public and its support is rapidly eroding because of the mismanagement and waste which has occurred in the acquisition process. If we expect to regain the public's confidence, we must not only improve the management of weapons acquisition, the public must be convinced that we have improved it.

Of all the problems that must be brought under control to maintain the public's support, cost growth is the most visible. Unless we have a cost estimating and reporting process which is open, consistent and as accurate as humanly possible, we stand little chance of curbing cost growth. Bad cost estimates eventually expand and multiply into cost growth steamrollers that are extremely difficult to slow down.

The GAO study raises three major concerns with the cost estimating process that I will be particularly interested in exploring today.

First, it points out that the cost estimating procedures used by the Defense Department are not uniform, often inconsistent from program to program and in many cases poorly documented. For example, on the Bradley fighting vehicle, almost \$1 billion was "saved" on the cost of the system by deleting certain items from the official program, even though these items probably would be funded elsewhere in the DOD budget. In another case, documentation concerning the cost estimates for a Navy landing ship, the LSD-41, were so poor that GAO could not determine how the estimates were done.

In short, it appears that cost estimates are in many cases built on a foundation that is little more than quicksand. Sherlock Holmes would have had difficulty in tracking these cost estimates through the labyrinthine and tortuous process that is used in many weapon programs.

Second, I am concerned that cost estimates appear to do little more than fulfill reporting requirements. They are not used as management tools to constrain cost growth on programs. For example, on the Bradley fighting vehicle over \$5.6 billion in cost increases since 1979 cannot be explained by the program office for the weapon and GAO found that original estimates done on the system were not used to establish a cost track or to maintain cost control. To quote from the GAO report, the cost estimates "had no other apparent purpose than to meet the Army . . . requirement that a program cost estimate be prepared. . . ."

Finally, the GAO study shows that the reports made to Congress on cost growth in major systems are sometimes inaccurate and even misleading. The selected acquisition report, or SAR, is supposed to give Congress current and accurate information on weapons costs and schedule changes but as the GAO report shows, there are sometimes major differences between the cost estimates that the program office has developed on a weapon and the costs that are reported to Congress. For example, estimates on the cost of the Hellfire missile maintained by the program office were \$150 million higher than the costs reported to Congress on the SAR. The B-1 bomber cost estimate as reported on the SAR excludes certain items from the projected costs which are usually reported as part of an aircraft weapon system.

Let me point out that DOD has initiatives under way to reduce cost growth and improve the cost estimating process. For example, in April of 1981 the Department instituted a series of 32 reforms known popularly as the Carlucci initiatives to improve the management and cost effectiveness of major acquisitions.

The GAO report I am releasing today, however, indicates that the reforms have so far done little to stem the cost growth tide or improve the accuracy of cost estimates. I would also note that there have been literally dozens of reform efforts in the past, most of which included improvements like those in the Carlucci initiatives, and things have not gotten much better. A study done by the Navy that I have reviewed indicates that of 50 common reforms which have been tried in the past decade or more to improve acquisition management, almost no progress has occurred on approximately half and only "some" progress on the other 25.

As the Navy study correctly points out, procedures alone will not control cost growth and ensure more reliable cost estimates. Attitudes must change so that cost control and effective management become an important part of the program manager's job.

I am becoming convinced that we will not be able to change attitudes and ensure cost effective management unless we make fundamental changes in our acquisition system. I have proposed the creation of a Civilian Acquisition Agency in DOD staffed by well-trained, career professionals who are thoroughly familiar and experienced in the business management function of acquiring weapon systems. I believe this approach, in contrast to the system we now have which frequently rotates managers in and out and does little to encourage employees to take on acquisition management as a career, is worth serious consideration and I want to explore the idea with our witnesses today.

I welcome them and look forward to their testimony.

Chairman ROTH. Mr. Bowsher, I welcome you and your colleagues here and would at this time ask you to introduce your colleagues and then proceed with your statement.

TESTIMONY OF CHARLES A. BOWSHER, COMPTROLLER GENERAL OF THE UNITED STATES, GENERAL ACCOUNTING OFFICE, ACCOMPANIED BY JOHN L. CARTER, GAO EVALUATOR, NSIAD/RDA & GP, DONALD E. DAY, SENIOR ASSOCIATE DIRECTOR, NSIAD/SPECIAL PROJECT-FUTURE COST OF WEAPONS SYSTEMS, AND WILLIAM W. CROCKER, GAO EVALUATOR, NSIAD/DMTAG

Mr. BOWSHER. Thank you very much, Mr. Chairman.

Don Day, on my left, is with me here in charge of our work on major weapon systems, John Carter is the man on my right, and he was the person in charge of this report and this job that we did for your committee, and Bill Crocker on my extreme right is the gentleman that did the work looking back 15, 20 years on the Five-Year Defense Program [FYDP], the price of the FYDP, and looking

forward to the extent that we can, and those are the areas that we will be discussing today.

In fact, I will be talking about cost growth, one; two, the Department of Defense's cost estimating and reporting; and three, the underestimation of funding requirements in the 5-year defense programs, or the FYDP's. A detailed statement has been provided for the record, and I am going to try to summarize that here with a few pages of a shorter statement.

Before getting further into my testimony, let me give you some basic background, Mr. Chairman, that illustrates the cost growth trends over nearly a 10-year period. Chart 1 over here compares cost growth figures for the DOD systems in 1975, 1979, and 1983.¹

Chart 2 compares the current—

Chairman ROTH. Let me just call attention to something. If I understand that chart, there was a significant jump. What are the figures for 1975, the cost overruns?

Mr. BOWSHER. The cost overrun there is—let me see. My eyes aren't too good, either. \$55 billion.

Chairman ROTH. Fifty-five percent?

Mr. BOWSHER. Yes, it's 55 percent higher, and then in 1979 it is 92 percent higher on a total growth of \$123 billion, and in 1983 it's an 81-percent increase on a total growth of \$276 billion.

Chairman ROTH. Do you have any explanation? There is some drop between 1979 to 1983.

Mr. BOWSHER. Yes.

Chairman ROTH. From 92 to 81 percent. Is there any explanation for that?

Mr. BOWSHER. That is a very good question, Mr. Chairman. You had 11 new systems added, and what DOD did in reporting those systems is to assume that the development estimate and the current estimate were the same, and that brought the average down. If you were to exclude the 11 new systems added in 1982, that figure really would be 104 percent instead of 81 percent.

Chairman ROTH. So what you are saying is there is not an improvement—

Mr. BOWSHER. There is not an improvement on most of the systems, that is correct.

Chairman ROTH [continuing]. On the same basic information or data.

Please proceed.

Mr. BOWSHER. OK. Chart 2 compares the current estimates with the initial development estimates for weapons systems included in the selected acquisition reporting systems with systems which are not included on the SARS. I think you can see there that what you have is that the SARS had a 90-percent increase, and weapon systems that were not reported on the SARS had a 99-percent increase.

Chairman ROTH. Is there any explanation for that difference?

Mr. BOWSHER. No. I think it is hard to pinpoint an overall explanation for that, but I think it is important. Why we wanted to show it was that many of the systems that are significant but not over the threshold to put them on the selected acquisition report-

¹The charts referred to in Mr. Bowsher's testimony appear in his prepared statement, p. 59.

ing system has a trend with somewhat similar, even a little more growth, you might say, than the ones that were on the SARS.

Then chart 4 presents information by generic type of weapon systems, that is, land vehicles, missiles, and aircraft, and you can see from this chart that the cost growth is a continuing problem and one that pretty much goes across the board by weapon category.

Chairman ROTH. Since I am the only Senator here, I am going to interrupt, if you have no objection.

Mr. BOWSHER. Sure, no objection at all.

Chairman ROTH. One of the things that mystifies me is why is the increase so substantial for vehicles compared with ships, aircraft, helicopters, and particularly missiles? It would seem to me that vehicles should be less difficult to construct, say than ships.

Why is the figure so high there? Please call on anybody you want to.

Mr. BOWSHER. Go ahead.

Mr. CARTER. In the vehicle category, there are two systems that showed very, very high cost growth; one is the LVT-SLEP Program. That is a Navy program. It is the service life extension program of the land vehicle transport system. Two programs showed very high cost increases; the LVT-SLEP Program showed a 4,000-percent increase and the Bradley Fighting Vehicle showed a 2,000-percent increase, so in that sample of 10 vehicles, you had two that showed very, very large growth. That is why the vehicles as a whole show a large cost growth.

Chairman ROTH. They are two horrendous ones.

Mr. CARTER. They are two very large ones.

Chairman ROTH. All right. Please proceed.

Mr. BOWSHER. On balance, Mr. Chairman, today's military acquisition process is characterized by programs which are extended and exceed the original cost estimates and encompass fewer units than originally planned, as you had pointed out earlier. DOD attributes most of the cost growth to quantity increases to fill original objectives or new requirements and inflation.

We do not disagree that these factors are significant contributors. But we would add that overoptimism in cost estimating seems to transcend all the reasons cited by DOD for cost growth, and, therefore, is the principal contributor to underestimates.

I will now proceed with the focus of the testimony and hopefully some suggestions we make today for improving the cost estimating and reporting process will assist the committee in its oversight function.

Chairman ROTH. Could I just ask you a question or two? You say overoptimism is the principal contributor to underestimates.

What is the motivation for overoptimism?

Mr. BOWSHER. Well, I think basically, it is to get the program approved and get it into the POM and into the FYDP. In other words, one of the great problems here is if the estimate is too high, people worry that the program won't get approved. Also, if it is too high in total, then they feel something will get squeezed out. So I think there is a great, unfortunate incentive here to keep the estimates low and not face up to the real cost until you get close to the production decision.

The problem with that is, as we will state later, that when the bill comes home to be paid, then you have to start cutting back or stretching out the program, and then you get very high unit costs, and after you have spent \$1 trillion for defense, as we will now, for every 3 or 4 years, people are going to be disappointed as to how much military equipment they have actually been able to buy, even though these are very large defense budgets.

One of the reasons is we have got so many programs jammed in there based on these lower estimates.

Chairman ROTH. If I understand what you are saying, it seems to me, in effect, what is happening is that the estimates, the underestimates, the overoptimism, whatever you want to call it, is not for the purpose of providing accurate cost estimates, but really to get the program instituted. To what extent is Congress—you know, we over here like to blame the other side all the time, but isn't there a lot of connivance within the Congress on this matter?

Mr. BOWSHER. I think Congress does play a role, Mr. Chairman, because I think that there has been this history of overoptimism on the cost estimates, and yet Congress goes along and funds it. Also, Congress wants to try to force, let's say, efficiencies through lower costs, and so the services tend to respond to that. Many times it's something that just doesn't pan out, and therefore, you do have incentives and pressures coming from Congress that have, over the years, I think, encouraged this to continue. I think eventually, Congress will have to be the one that says to the Defense Department, "We want realistic estimates, and we're willing to see less program in that defense budget, and we want to be able to buy our equipment at lower quantity costs. We want to buy the quantities that you originally said we needed rather than to have all this program stretch-out."

I think we are going into that period right now, as you can see. As the budget deficit drives some cutbacks here, you are going to see more and more of the cutbacks being offered up as being program stretch-outs rather than cancellation of programs.

Chairman ROTH. I'm afraid that to make meaningful reform it takes both reform of Congress and reform——

Mr. BOWSHER. That is correct.

Chairman ROTH [continuing]. Of the Pentagon. I don't know which is more difficult. [Laughter.]

Please proceed.

Mr. BOWSHER. Let me proceed, then, on the cost estimating study we recently completed. At your request, we performed an indepth review of the DOD cost estimating process on seven selected weapon systems. This report was released today, and we determined that DOD could have improved its cost estimating and reporting on those systems by: one, improving its cost estimating guidance and basic data used for estimating, and ensuring stricter implementation of the guidance; two, introducing more realism into the assumptions and methodologies used; and three, making fuller use of the recommendations of DOD's independent estimating groups. We found that DOD's reports to the Congress need improvement and that DOD and the services have efforts underway to address some cost estimating issues.

DOD needs to clarify its cost estimating guidance and resolve conflicts in the guidance. We found conflicts between definitions, instructions, and guidance issued by the Office of the Secretary of Defense and the services.

Improved guidance without strict implementation would be of little value. In addition to improving its guidance, DOD should ensure its implementation. Examples drawn from our sample weapon systems illustrate the problems of inconsistent estimate structure and inadequate estimate documents that result from poor implementation of existing DOD cost estimating guidance.

DOD must ensure its estimates are based on accurate data. Estimates are often based on contractor data that is sometimes over optimistic and I think sometimes very quickly gotten. This use of optimistic estimates results from an environment within the DOD community that pushes contractors, and those within DOD, to sell a program to the services and to the Congress. This is done by presenting an optimistic estimate to put the program in a favorable light.

Realistic assumptions and sound methodologies are essential ingredients to good estimates. Improvements are needed in the recognition of program risk and consistency of inflation recognition. Cost estimators base their estimates on the information available to them at the time, and assume that the system they are estimating will not experience typical changes in scheduling, funding, engineering, or the threat. Rather than assuming they will not occur, estimators should identify these changes, determine their probability, and increase the amount of their estimate by the probable magnitude of the changes.

DOD does not recognize inflation consistently. In some cases we found contractor inflation indexes were used to calculate inflation. In others, inflation was used as a device to hide other cost increases.

Cost estimates, whether done independently or in-house, must be based on realistic assumptions, rather than the optimistic assumptions sometimes favored by DOD management. We found that cost estimators were instructed to use optimistic assumptions related to contractor profit, the construction schedule, and allowances for uncertainties. DOD has decreased its cost estimates to fit within the fiscal constraints of the service budgets, and has excluded relevant program costs from its estimates.

Chairman ROTH. Could I ask you a question there? I alluded to it earlier. Would it be helpful, in at least a part of their cost estimate picture, to have a range? The reason I raise that is, aren't there certain factors that are very difficult to anticipate?

Mr. BOWSHER. That's true.

Chairman ROTH. You can say what may be optimistic or you can say what may be pessimistic. For example, in your own report, you estimate that the costs could be anywhere from, I think, \$174 to \$324 billion. As part of the basic information, would it be valuable to have the range of cost and then spell out the assumptions on which they are based?

Mr. BOWSHER. Yes. I think it would, Mr. Chairman. It is one thing we have advocated for some years, that DOD consider that. I think it would give a much more realistic picture of what those

weapon systems might cost. As you point out, these are difficult things to forecast. The technological risk, the chances of adding an improvement that might meet a different threat that you are not even aware of today, but you know that those are coming down the road, those are hard to estimate with any preciseness, but we have a history of having to do that, having to make those changes and improvements, and I think it would be much better if a range with some of that in there were put together.

Chairman ROTH. Let me ask you this question. Would that be inconsistent with having some kind of a ceiling that served as a cap?

Mr. BOWSHER. I think you could build in ceilings, somehow, even with a range. In other words, you wouldn't have to say the bottom or the top would be the cap.

Although OSD and the services have established cost estimating groups to help ensure that cost estimates are more reliable and valid, efforts by such groups have not been effective. Independent cost estimators' recommendations to recognize increased program cost were sometimes not accepted by DOD decisionmakers, and those recommendations were validated as program costs increased over the life of the weapon system.

OSD and the services recognize the need to improve their cost estimating process, and as a result, they are continually taking steps to improve this capability. OSD, the Air Force, Navy, and Army each have efforts underway to improve their cost estimating practices. If fully implemented, these efforts should improve some of the weaknesses in DOD's cost estimating and reporting.

In addition to the efforts underway in DOD, we believe improved guidance, use of more realistic assumptions and estimating methodologies, and continued emphasis on the value of independent cost estimates would go far in improving the estimating process and, in turn, the quality of information provided to decisionmakers. Our report contains detailed recommendations designed to assist DOD in these areas.

I would like to switch to reporting. DOD's cost reports to the Congress need to be improved. Cost estimates are reported to the Congress through SAR's, unit cost exception reports, and the budget process. Major concerns have been expressed by the Congress and its oversight committees for some time over the accuracy, timeliness, and completeness of DOD's reporting. We found that one, SAR's do not reflect the latest anticipated program acquisition costs; two, SAR's do not show total planned acquisition objectives; three, important cost categories are sometimes not reported in SAR's; four, costs are not reported consistently in the SAR's; and five, unit cost exception reports have not solved the problem of the lack of current data reported to the Congress.

It is also difficult to compare the information in SAR's with that in other budgeting and accounting reports provided to the Congress. A few examples illustrate some of these problems: One, the B-1 bomber baseline SAR estimate excludes certain costs, such as \$300 million for flight simulators for pilot training, normally included in aircraft estimates.

The SAR's do not include ammunition costs unless the ammunition is unique to a specific weapon system. This reduces comparability of the cost estimates for various systems.

According to the CBO cost estimates for some 13 systems in the December 1982 SAR excluded at least \$40 billion in program costs reported elsewhere to the Congress.

In times of constrained resources, it is more important than ever that the Congress and executive branch officials have the information they need to ensure that resources are being spent effectively and efficiently. Management and project reports, such as the SAR's, should be designed to ensure that program objectives are achieved and costs controlled. These reports must be timely, useful, and readily understandable. Government financial systems should be designed to provide that information. Yet, today's financial systems—not only in DOD, but throughout Government—provide little of the reliable cost data essential to effectively monitor program execution, anticipate overruns, and provide a basis for future program and budget planning.

All too frequently, the results are the types of problems discussed here today—cost estimates which are unreliable, inconsistencies between budget requests and accounting reports, and an inability to compare planned budgets with actual costs and results. These problems exist in large part because DOD and other departments and agencies generally do not budget and account on the same basis. The absence of a consistent basis for reporting costs makes it difficult, if not impossible, to compare the costs of similar activities in the Government.

We believe it is time for a major overhaul of financial management systems Governmentwide. An integrated financial system that planned, budgeted, and accounted on the same basis could produce accurate, comparable, and readily understandable management reports on programs, organizations, and projects to support both management and congressional decisionmaking. The benefits of such a system include: The ability to compare planned with actual program and project costs; the ability to compare the costs of similar operations across the Government; more accurate budget estimates based on actual past program and project costs; the ability to measure the input of cost and the output of performance; and increased accountability for the management of public funds.

Our assessment of the problems and our ideas on how we might proceed are discussed much more extensively in a two-volume report currently in draft form.

I appreciate, Mr. Chairman, the opportunity to come and discuss that with you the other day. I plan to schedule similar meetings with other members of this committee and other Members of the Congress.

We hope this report will stimulate widespread discussion of these issues, leading to the consensus we need if reform is to be successful.

Now, I would like to move to the FYDP, and what we are concerned about is the undercosting of the FYDP.

Historical data shows that DOD's FYDP's are consistently undercosted. The dramatic increases in the defense program since 1980 and the preception that the cost of these huge increases may continue to be significantly understated has become a serious concern to the Congress.

I will highlight for the committee the findings and the conclusions of our recently completed assessment of the undercosting problem, giving particular attention to the procurement of major weapon systems.

You and other Members of the Congress were provided a briefing paper on this in March.

Our analysis of the underestimate in FYDP total funding shows a systematic pattern over 20 years. If significant management improvements are not realized, and historical trends continue, the fiscal years 1984-88 defense programs will absorb \$173 billion to as much as \$324 billion more. That would be in current dollars.

As I stated at the outset, a major contributing factor to undercosting is bias in DOD cost estimating practices which encourage optimistic cost assumptions, while excluding actual cost experience and the reality of the budgeting environment.

In analyzing the planned weapon systems cost versus actual total obligational authority provided for 97 major weapon systems during the course of FYDP's for a 20-year period from 1963 to 1983, we found that the Congress must grant an average of 32 percent more obligational authority in an effort to execute the plans.

Even with the additional moneys, the number of weapon systems which DOD is actually able to procure with those funds is less than anticipated.

As an example of the magnitude of the problem, I note the latest 5-year plan for which actual data is now available—the fiscal year 1980-1984 FYDP's. For the last 5 years, actual appropriated total obligational authority exceeds DOD's original projections by approximately \$246 billion. Although it is not certain that the historical pattern of underestimation of funding requirements will continue, there is little evidence at this point of a major change in these trends.

As you can see in the chart that we provided, total obligation authority continues to exceed DOD planning estimates.

DOD has stated that cost planning was often too optimistic in the past, and despite efforts to address the problem, it continued to plague the DOD through the late 1970's. DOD now believes it has instituted procedures that will result in more realistic plans in the future.

Future improvements in overall program planning and efficient execution depend heavily on better cost planning. The proof will be in the effect on overall defense program costs and execution.

Much will depend on whether the estimates in DOD's 1981 through 1984 FYDP's are in fact more accurate than in the past.

If these FYDP's are a reflection of better procurement planning and cost estimating, we should expect the level of total obligational authority required to more closely approximate the FYDP figures as an indicator of progress.

A second indicator will be the degree to which defense programs are fulfilled within planning estimates. This is most likely to be achieved if the Secretary of Defense and the Congress have more accurate cost information on DOD's 5-year programs. Better cost assessment is fundamental to making the right tradeoff decisions today on what will shape our long-term defense policy.

Mr. Chairman, that concludes my prepared statement. We would be pleased to answer any questions.

Chairman ROTH. Thank you, Mr. Bowsher.

I have a number of questions. Before I start, do you have a preliminary statement, Senator Pryor?

OPENING STATEMENT OF SENATOR PRYOR

Senator PRYOR. Mr. Chairman, I would just like to say, first, that I commend you for this hearing and for looking into this matter. It is a matter of grave concern to me and, I think, all Members of the Congress.

I would like to compliment GAO for this very fine and revealing report. I have a statement, Mr. Chairman. I would like to put it in the record, and possibly ask some questions later.

Thank you, Mr. Chairman.

Chairman ROTH. Without objection, the statement will be included in the record.

[The prepared statement of Senator Pryor follows:]

PREPARED STATEMENT OF SENATOR DAVID PRYOR

Thank you, Mr. Chairman. I'm pleased to be here today to hear testimony on the problems which the Department of Defense is having with cost estimates for weapon systems. This is an area of DOD operations which demands Congressional oversight, and may require corrective legislation. I'm hopeful that today the members of the committee can get a firmer idea of why many weapon systems cost taxpayers more than initial DOD estimates indicate.

I would like to commend our chairman—Senator Roth—for requesting the GAO report which is being released today and for scheduling this hearing. His leadership and concern in this area is certainly appreciated.

The problems which GAO identified with DOD's cost estimating procedures are disturbing to me, but frankly not surprising. I've been convinced for some time that massive corrections should be made within DOD, including substantial reform of procurement procedure.

In this report, GAO has cited a number of problems which seem to dominate the cycle of underestimation of costs for DOD weapon systems. Again and again the word "overoptimism" is used to describe a cost-estimating approach where assumptions are made which are both unrealistic and unbusinesslike and which tend to significantly reduce the estimated costs of a given weapons system.

Optimism is fine; I'm all for it. But I am disturbed about an activity which clouds the picture and distorts the true cost of a weapons system which taxpayers will be later called on to make up millions of dollars of difference in price. The American people want to know what they are getting and how much they are paying for it. Congress must make sure that this information is accurate, since it appears that too frequently it is not.

Finally, I'm hopeful that DOD will be responsive to GAO's findings and will tighten its cost estimating procedures. In doing so, it will enhance budget planning accuracy as well as national security.

I look forward to the statements of our witnesses.

Chairman ROTH. First, let me comment on the financial management, because I think that is a critically important problem that must be addressed government-wide. Frankly, I think our financial management is in the 18th century.

One of my concerns, to be candid, is that I think OMB, which should be playing a major role, has been overly involved in budgetary matters and not involved enough in management.

In any event, I want my staff to be sitting down with yours to see how we can address this critical problem.

Mr. BOWSHER. Thank you, very much, Mr. Chairman.

If I could just pick up on that point, as I really agree with you, and I think that is one of the major problems we are facing here in DOD, but also, as I point out, in the rest of Government. In other words, our accounting systems, just as you are saying, are really old and antiquated. In some cases they have been computerized, but generally, just by computerizing the old system.

Chairman ROTH. Didn't you say we had 100 computer systems or thereabout?

Mr. BOWSHER. We have 350 accounting systems in the Federal Government based on the December results of the financial integrity act work and many of them go back to World War II, and even some into the late 1930's as to when they were really set up.

I think that it is time now for GAO, OMB, the Treasury, the central agencies, working with some of the large agencies like DOD, to get together and come to Congress with a plan as to how can we modernize and tie the accounting system into the budgeting system and tie project reporting into both the budgeting and the accounting systems, so that when these numbers come up on a project reporting system like the SAR, there is integrity to the numbers and they cannot be changed quite as readily as in the past.

Chairman ROTH. I think we ought to take steps now to initiate that kind of action, so we will be meeting with you.

Let me go back to some of your testimony. I have already asked you a number of questions. I apologize for interrupting your statement.

Mr. BOWSHER. That is fine, Senator.

Chairman ROTH. There are a number of steps being taken by the services, and in your testimony, if I understood it, you don't see these steps really accomplishing the basic reforms that are essential to make the figures reliable.

Could you tell me, through means of comparison, how the various services are performing at this time, what they are doing, and how you evaluate these measures?

Mr. BOWSHER. Yes. The services have been, for a number of years, trying to improve their cost estimating, and they have been trying to improve their capability.

I think one of the real problems is the assumptions. We looked at the cost estimating manual, which was put together, June 1971. One of the primary methodologies in the manual is a learning curve, a learning curve where you keep saying, as we build more and go into future years, the cost will come down.

That is true if your weapon system is going to stay basically the same.

But I think what we are seeing as we look at these weapon systems and look at them over a long period of time, is that innovations are put into them. There is just constant change, and constant change generally means greater technical capability, which means greater cost.

So I think we ought to really look at some of those assumptions and some of those methods that have been used in the past which don't hold up historically. In other words, I think we have got to say, if this is the historic pattern for the last 20 years on our major fighters and our major ships why do we continue to think that in

the second or third year we are going to get a 90-percent learning curve and then an 85?

I think it has got to be relooked at and ask are the assumptions realistic or should we just assume a certain amount of change and increased cost if we start that fighter plane or that attack plane down the production line in planning to build it.

So I think those are some of the things that have to be looked at in addition to the improvements they are making.

I think also, this independent cost estimating effort that they have had, now, for many years over at the Defense Department, needs attention. I asked my people how many people Defense has working in that area, and they said 14, but that is only part time.

Well, you cannot do independent cost estimating with 14 people on a part-time basis at the Office of the Secretary of Defense. You are monitoring, I think it is 80-some weapon systems, now, under SAR's.

As you can see, the next 80 or 100 weapon systems that fall right into that threshold have big dollars involved with them, and so if you are going to do a significant amount of independent cost estimating and not just rely upon the assumptions that were built into the original cost estimates, why, then, I think you have got to have adequate staff.

So I think that is another factor that has to be considered here.

Chairman ROTH. Let me make several observations and make sure I understand what you are saying.

No. 1, as I understand you, the fact is that in making their estimates, they traditionally say that the costs are going to go down because the volume or quantity is going to go up.

Mr. BOWSHER. If we have a learning curve with the labor people on the production line.

Chairman ROTH. The whole process becomes known.

Mr. BOWSHER. That is right, yes.

Chairman ROTH. But the fact is, that has not proven true historically. Just the opposite has proven true, primarily because of changes.

Mr. BOWSHER. That is right, yes. In other words, we might be getting some of that learning curve, but all the other things we do—

Chairman ROTH. Offsets it.

Mr. BOWSHER [continuing]. Offsets it and then drives it up. So if we are looking at the cost estimates in the out years, we better be realistic that those other things are coming into play.

Chairman ROTH. That, to me, goes back to another issue that has been raised many times, a question of freezing the design and not constantly changing and goldplating.

Now, it is my understanding that in some of the services, the Air Force, for example, their top officials are recognizing that if you are going to bring costs down and if you are going to have reliable figures, somewhere along the line you have to say no to those who want to incorporate the latest change.

So that to me, a key problem in the whole matter is freezing the design somewhere along the line and not trying to constantly add design changes.

Isn't it a fact that many contractors rely on these changes? They buy in cheap, and know there are going to be changes; and doesn't that give them the opportunity to recoup?

Mr. BOWSHER. I think there is no question that changes give the contractors an opportunity to recoup, and I think also there is no question that holding down the number of changes is a very difficult problem and one that has a big impact on what the systems eventually cost.

Chairman ROTH. That has got to be required at the topmost level, in my judgment, if it is going to work. I must say, I have heard that at least one of the secretaries is recognizing that problem and trying to institute that kind of a change.

Let me make a couple of other comments on what you have said. You talked about the number of personnel. There are not very many involved in this cost analysis.

I would like to sit down and have some kind of a study made for me of the Pentagon personnel, because I understand that at many of the facilities and elsewhere, there are literally hundreds of Defense people involved, and yet every time we talk about a critical function, whether it is operational testing or whether it is something else, we only have a few people, even though you literally have thousands of people sitting over there.

I would like to have some kind of a breakdown that lists the number of defense personnel involved in procurement, what they do specifically, and how they are assigned.

How many basic prime contractors do we have doing business with the Defense Department, 20 or 30?

Mr. BOWSHER. Something like that, 20 or 30.

Chairman ROTH. The reason I think that—

Mr. DAY. It is beyond that.

Mr. BOWSHER. But there is a number, it is a fairly limited number, that has a very high number of the prime contracts.

Chairman ROTH. I think that is a very important factor that is overlooked as we address these problems. People say, "Well, you cannot do anything about it because you are dealing with billions of dollars."

The fact is, you are dealing with a relatively few number of contractors, and if you had the proper management techniques, you ought to be able to put in the kind of controls that are necessary. I think the problem is that you have too many people meddling and not really controlling; 14 is ridiculous, in my judgment.

But one of the things in your recommendations, and I think it is a sound, though shocking one, is that at this late date we do not have a standard handbook for guidance on how to estimate costs, or what should be included in a cost estimate. Now, if you are comparing apples and oranges, you are not going to get very far.

I must add that I don't like to write things into the law. I think one of the problems we have had in the past and part of the problem at the Pentagon is that whenever we try to correct something, we try to write some reform into the law. Then, once you write it in, you never get rid of it. Maybe it helps for awhile, but then it becomes obsolete. It does seem to me, however, that the Secretary of Defense or his chief lieutenant in this area ought to take appropriate action on that recommendation of yours. In any event, we

shall write a letter and would like to talk to you about the need for improved guidance.

Mr. BOWSHER. I think it is important because I think the Defense people feel that they have adequate guidance there. What we found in looking at the seven systems is that there was not consistent guidance in all areas, and we think that should be made consistent. But equally important, and maybe more important, is that the guidance has to be followed. In other words, somebody at some level, whether it is at the service secretary level or at the OSD level, has got to be making sure that if it says, "This is how you develop a work breakdown" or "This is how you should estimate your inflation factor," that that is the way it is done.

What we have found here, and I think what you would find if you went back and looked at any seven systems historically in the DOD, is that there is a lot of ingenuity put in as to how to calculate the estimates, even though there is guidance available.

I think ensuring that the guidance is followed is a very key factor.

I think it would be good if you included that in your letter.

Chairman ROTH. There is no question that you have two problems: One is creating the policies, and the other is making sure that they are followed at the operational level.

I agree with the point you made earlier. I know that they do have some kind of a regulation or guideline handbook, but my understanding is that it is very general.

One of the problems I find is that the Pentagon always has a regulation for every issue you raise, but nothing happens. So what I would like to have from your office is some specifics on this handbook. I will ask my staff to contact yours to work on this.

One more question, and then I will ask Senator Cohen to present any questions he may have. You talk about the SAR's and say that often, the information available is not the most recent.

For example, I think one case involved the cost estimate for the Hellfire missile where there was a \$221 million difference between the Army's most recent information and that supplied to the Congress. That means that Congress, in effect, is getting misinformation.

I hate to suggest this, but you know, we pass legislation directed at the private sector called truth in labeling, or truth in reporting. It just may be that the Government should be held similarly accountable.

I don't like to go that direction but it bothers me, and if we cannot get what we need, if the Pentagon doesn't insist that it be accurate and up-to-date, then I think we are going to have to consider some legislation to penalize.

After all, the contractors are responsible and reliable if they don't supply, in their estimates, the lowest, most recent information they have on costs; isn't that correct?

Mr. BOWSHER. That is correct.

Chairman ROTH. And if we require the private sector, why shouldn't we require the public sector?

Mr. BOWSHER. I think it is very important that the latest information be provided on the SAR's. There is a point where it has to be officially approved, and that, I think, has been overinterpreted

at Defense as saying: If it isn't officially approved, don't put it on the SAR. I definitely think you have to keep the discipline in your organization at DOD that maybe the estimate that is in the column is the approved one, but if there are plans to, let's say, increase or decrease the quantities or they have got information from the contractor that the cost is going up, that should all be put in there, so that when that SAR report comes out, it is the most current information for the Congress as well as for their own decisionmakers.

It is important for their own decisionmaking because unless the program offices know that the SAR's should have all the latest information in it, why, then, there is going to be a tendency, and I think it has been there for many years, to decide when is the right time to put forth the new information.

Chairman ROTH. The problem I have with official sanctions is that if they want to, they can delay. It is like the contractor saying that unless the head office approves those figures, they aren't official, but I understand the problem you have.

Chairman ROTH. Senator Cohen.

Senator COHEN. Thank you, Mr. Chairman.

I would like to suggest that in addition to having more up-to-date, as well as more accurate information, that something be done about the SAR, itself. Frankly, I don't know anybody who can understand them.

I have heard Air Force generals testify in the past, who would shake their heads at a SAR, when trying to understand exactly what it said. So it's not only a question of getting more up-to-date information, but making it more comprehensible or understandable, to people who, on this committee, or staff, want to understand what is going on.

I don't think the SAR's are understandable or comprehensible now, no matter what the information says.

Mr. BOWSHER. Senator, I would like to come and see you on that subject, because, as I pointed out earlier in my testimony, we have put together a couple of draft documents here on what we think would be a possible modernization of the budget in Congress, and I think this project reporting is a key part of it and should be understandable, and it should tie to the budgeting system and it should tie to the accounting system.

Until the dollars are reported, the real dollars, you might say, that everybody is making decisions on, then the SAR report remains something here on the side that the project office had to get out, they feel, but nobody is managing with the information, nobody is using the information, and they come over here and they can't even explain it to you.

Senator COHEN. In addition to that, I would note that in your most recent report you made a similar recommendation back in 1975 to revise the SAR's, and here we are in 1984 and nothing really has been done of any significance.

Another issue which is of concern to me is pointed out by Norm Augustine in his book, "Augustine's Laws." He indicates that there are individuals who rely upon statistics much like drunkards who use lampposts, more for support than illumination.

Augustine notes that we can prove anything with statistical information and that we labor under a layer of precision. For exam-

ple, he points out that when we first had the F-18 it was, I think, \$12,875,300,000. A few years later, it came back at \$24,023,300,000. The only thing that changed was the first figure, which doubled.

Augustine noted at that time—I believe his book was published in 1982—that 67 of the major programs underway were 100 percent over their original estimates. So we labor under this kind of illusion that because we have precise estimates there have been detailed analyses. We know we are holding to something that is fixed, and, lo and behold, those numbers are all changed.

I think what the chairman is suggesting is perhaps that we have a range of estimates. Even though that is perhaps more vague, ultimately, it might prove more realistic.

Mr. BOWSHER. That is right. It might give you a better sense of what this program is going to cost, if you had that range and less precision, I agree with you.

Senator COHEN. Another thing we have to be careful with is changes. If you build a house and you sign a contract with a contractor, you have a fixed price. If your wife or you say, "I would like to change that bathroom or put in a window," suddenly, you have got major price increases. I think this has been a problem with major systems.

On the other hand, we happen to be living in the age of future shock and the age of high technology in which yesterday's IBM has been replaced by today's Apple III, or vice versa, in a period of 6 to 8 months, and that we do have an obligation when we are building the very best systems that we are trying to build, be it the B-1B or Stealth, that we incorporate advantageous technological changes.

They are trying to incorporate some Stealth technology in the B-1B, for example. Stealth technology is still on paper for all practical purposes. We may never get to it. I hope we do. We might not. We shouldn't, however, be arbitrary in what changes we say have to be fixed in the contract.

Mr. BOWSHER. It is a very difficult issue, but I think I can just tell one story to illustrate both what you are pointing out and what the chairman pointed out, and that is to pick up on your F-18 illustration.

I happen to know the retired admiral who was head of the Air Systems Command when the Navy was producing F-18 in its early stages, and he told me it was just a terrible fight, day in and day out, to keep the changes down. Everybody wanted to make changes.

There is no question that we are in this technological age and that changes come fast, and I think the important ones have to be made to keep us up to date. But I think that the number of changes and who can authorize them is very key to the cost growth.

Senator COHEN. You testified before this committee in 1981 suggesting we had a very serious problem with cost growth. You are back here today still saying that we have a very serious problem and that nothing has been done.

I believe the Deputy DOD Comptroller, John Quetsch, takes some issue with your assessment of the progress made, saying that the Carlucci Initiatives have been successful in controlling cost growth. What is your judgment on that?

Mr. BOWSHER. I think that the Carlucci Initiatives are going in the right direction. I think that some of them look like they are having some effect, like the issue of multiyear procurement. That seems to us—GAO has supported that over the years—that seems to us to make sense. Yet we are having trouble, as we are asked by Congress to validate the nominations by Defense each year, to see what savings Defense is estimating, and even if you were to take Defense's numbers, why, it is still, maybe, somewhere around \$16 billion. It is a fairly small percentage of the \$800 billion, so we think that the initiatives are helping. It is a little early yet to tell how well.

We haven't seen, in our overall tracking of the numbers, yet, the change in the FYDP pricing and the costing of the FYDP to see if that is going to pan out. We are hopeful that these changes are going to improve, and I know that Mr. Quetsch is going to put them forward, and rightfully so, to say that they are trying to correct these problems.

But I think until you get to some of the really gut issues of controlling changes—realism in your cost estimating, extending the tours of program managers—these are the gut issues that are going to determine how much cost growth there is.

I think you are going to have a problem, and I might be back here 3 or 4 years from now testifying on the same subject, unfortunately.

Senator COHEN. Let me touch upon the people problem for a moment, since this is key to dealing with the procurement process. The Navy had a study done back in 1981, and it was prepared by the Naval Material Command, that found, "We simply do not practice good business management in the Navy. The majority of acquisition practitioners are engineers who attempt to make business judgments, lacking the proper training necessary to make enlightened decisionmaking."

If people are key to this area, how do we deal with this problem? What would you recommend in the way of improving our procurement personnel—the acquisition practitioners, managers?

Mr. BOWSHER. I think we have got to get more stability into the program managers' tenure and the key jobs, in other words, the senior engineering people, the senior financial people that are watching the costs. I think the programs like Rickover's program and even the program like the S-3A where you had a lot of continuity in the program manager under Admiral Baughman, those are the ones that I think have a much better track record of getting a quality product at a reasonable cost, and I think, unfortunately, the Navy has not been able to achieve that in many of their other weapon system programs.

So I think those are the key issues, and they have the model. They have done it a few times, but they seem to have trouble in achieving it with most of the rest of their weapon system programs.

One thing I was encouraged about when I read Mr. Quetsch's testimony, or somebody's testimony, this morning, is that they now assign a budget officer, or kind of a financial person, in the Navy that is independent and reports to the Comptroller of the Naval Material Command. I think that is a big step.

I tried to get that adopted in the late sixties when I was serving as Assistant Secretary of the Navy and couldn't achieve it, because what you need is a scorekeeper, and you need a scorekeeper that is full time on these billion-dollar weapon systems.

They kept resisting it at that time, because they wanted the Systems Commands to continue to have the financial management function and kind of the central function in the Systems Command, but you just didn't have enough talent working on it. So I was encouraged when I saw that.

Senator COHEN. Just one final point, Mr. Chairman.

We talked a lot in the past about having more consideration or greater consideration given to the independent cost analysis within the Defense Department. These analysis seem historically to have a much better tracking record than some of the official cost estimates that are submitted to Congress.

Mr. BOWSHER. Yes.

Senator COHEN. Both GAO and, I believe, DOD are in agreement that while we ought not arbitrarily mandate that DOD give the CAIG the predominant role in the cost estimating process, it should be accorded some role.

Mr. BOWSHER. That is correct.

Senator COHEN. But what are we to do when we sit up here and we look at the record? We can look at what DOD has submitted, we can look at what the independent cost estimates have been, and they seem to come out better on the independent analysis than DOD. So what are we to do?

Mr. BOWSHER. I think requesting to see the independent cost estimates makes a lot of sense.

Senator COHEN. Should DOD submit an independent cost estimate at the same time they submit their own?

Mr. BOWSHER. I think it would be a good idea if we did, and I also think, though, and you have got to recognize that even the independent cost estimators' estimates have not been up there with the historic trend.

In other words, back to that manual I mentioned about the learning curve estimates, I really think that if they are going to fulfill the role that was originally envisioned for them, they have got to be really hard-nosed, and they have got to be able to put in those additional factors up to something that is realistic, and not just something that is a little different or a little higher than the service estimate.

I don't want to give a blanket endorsement here to the independent cost estimating function, because when I look at the historic record, I don't think they have done as good a job as they really should.

Senator COHEN. One final point, not necessarily a question. There seems to be some sort of friction historically, between the various departments, DOD, in particular, and GAO. In response to your most recent report, in fact, I believe the DOD filed a report saying "GAO doesn't understand the nature of the problem, that they don't understand the real difficulty for the criteria and they do not use the same criteria that we use in our analyses of these weapons systems."

There just seems to be resistance to accepting either GAO's analysis, saying, "You are really not the expert, that we are the ones who are out here dealing with this on a day-to-day basis. You come in from the outside and don't see it the way we do."

Is there any way to have a reconciliation between GAO and the Congress and DOD?

Mr. BOWSHER. I would hope so, but I think there will always be that friction between the outside reviewer and the person on the line who has responsibility. I don't know that it will ever be.

Senator COHEN. They say that you don't understand the nature of the problem.

Mr. BOWSHER. I think we do. [Laughter.]

In other words, I think we have some very qualified people. We have been reviewing these weapon systems now for a good many years, and I think we have got people that know how to do them, we have got people that are right up to speed on methodology on that, so I think we have been doing very good. We occasionally have a difference of opinion on a particular item, but on an overall basis—

Chairman ROTH. The problem is, you may understand it too well.

Senator Pryor.

Senator PRYOR. Thank you, Mr. Chairman.

At what stage of the procurement process should congressional oversight begin?

The point I am making with my question is this: It is always after the fact when cost overruns are publicized and we read about it then, and then we come forward with an oversight attempt to do something after the horse is already out of the barn.

At what stage can we improve our obligation to the taxpayer in this whole procedure?

Mr. BOWSHER. I think the earlier the stage, the better, because what your big issue here is is whether a program is worth going forward because of its need, and if it can meet the threat on that, and then, second, is the cost estimate and the scheduling, the technical risk, and all that, realistic.

I think you are absolutely right, Senator, that many times the Congress gets into it about what I call the production stage, where it is really starting in on the production. That is when many of the cost overestimates finally come to the fore.

I think that if the Congress could get in sooner to review, and if we could ever get a SAR report or a project report that is meaningful so that management over at Defense is using it, and the numbers tie to the budget and to the accounting systems, and that it is understandable, then I would think that periodic oversight hearings on the SAR reports would be a good way of doing it.

Senator PRYOR. Does GAO have the capacity to monitor defense contracts after they are let? At what stage does the General Accounting Office begin monitoring these contracts?

Mr. BOWSHER. The way we do it is not by contract, but by program, because each program has many contracts.

Senator PRYOR. Right.

Mr. BOWSHER. Yes. So what we generally do is we monitor, we look at the SAR's, and we monitor and review about 20 out of the 80 every year, and then follow up. Like on the F-18, we probably

have done three in its lifetime, I think, and we kind of try to follow from that point.

But we could support oversight, I think. If we could ever get the reporting systems working right, we could then support oversight hearings if you wanted to have them on individual weapon systems at various stages. We could do that.

Senator PRYOR. I think in your earlier statement you said that there are over 350 different accounting systems throughout the Federal Government.

Mr. BOWSHER. Yes.

Senator PRYOR. Does this also include reporting systems?

Mr. BOWSHER. No, that is the basic accounting systems. I'm sure there are many more reporting systems, for example the SAR reporting system is not included in the number of accounting systems.

Senator PRYOR. If there are 350 different accounting systems in the Federal Government, how many different accounting systems are used by the Department of Defense?

Mr. BOWSHER. I would have to supply that for the record. We have that number, but I just don't have it with me now.

Senator PRYOR. Would you say over 200 systems?

Mr. BOWSHER. I would say 100 to 200; I'm not quite sure. We can supply it for the record.

[The information referred to follows:]

According to DOD's Financial Integrity Act report of December 31, 1983, there are 154 accounting system in use as follows:

Army.....	70
Navy.....	14
Air Force.....	29
Other.....	41
Total.....	154

Senator PRYOR. Does the Air Force use a different system than the Navy?

Mr. BOWSHER. Yes. The Air Force probably has the best system at this time. The Air Force has a central accounting and finance center out in Denver, and they have, over the years, modernized their systems, and I think are in the best shape.

The Army lost control of their procurement account and appropriations in the early seventies, and were really in bad shape. But they have made quite an investment, and I'm impressed with their efforts out at Fort Benjamin Harrison, and they are trying to get down to eight basic systems. I think they are moving in the right direction.

I would like to give a good report on the Navy, but I'm not sure I can. [Laughter.]

Senator PRYOR. Does each branch of the military service have a different system from the other?

Mr. BOWSHER. Yes, each does.

Senator PRYOR. I assume that you don't like that disparity between various branches of the systems.

Mr. BOWSHER. Well, I don't mind if they had one, good basic system. If the three services could be like the Air Force as far as their accounting systems go where they could bring it into a cen-

tral place and summarize it and have a standard procurement system, a standard accounting system for the procurement, and then if we had it standardized enough so that that information could roll over to a central place like Treasury, I think that would be sufficient. I don't think we would have to force three services into it.

But what worries me is when I see so many different systems in one service, that worries me.

Senator PRYOR. You stated earlier—and I may have gotten in just at the time you were doing this, and I may have misunderstood you—that only 14 individuals are involved in cost estimating in DOD? That's not correct, is it?

Mr. BOWSHER. The independent, what is known as the CAIG, has 14 people in the fiscal year of 1984 budget. That is at the OSD level.

Senator PRYOR. Is that to monitor?

Mr. BOWSHER. That is to monitor. That is the one that develops OSD's independent cost estimates. You have another monitoring function in the Comptroller's shop, and I might add that I think that might be a problem, an historic problem at OSD, that you have had a split of financial management each between PA&E, sometimes known in the old days as Systems Analysis, and the Comptroller's shop.

I have oftentimes wondered if it wouldn't be better to get this back in the Comptroller's shop where you could have much more coverage, I think, over the integrity of all the numbers coming out of the Pentagon, not that I think that the PAGE function isn't very necessary to review programs on an independent basis. If the running of the financial management systems and the checking out of the cost estimates and the cost reporting that goes into the SAR's could be brought through one OSD function, I think you would have a stronger system, myself.

Senator PRYOR. I just find that very difficult to believe, that only 14 individuals serve that function which is, to me, one of the most critical functions of our whole national defense posture. I can't imagine us putting that function at such a very low priority in terms of what we need and what we don't need.

Mr. BOWSHER. I think it really limits their ability as to what they can do in an independent cost estimating function. When we look at some of their work, why, they necessarily have to rely sometimes on some of the assumptions that were built in by the services, because they just don't have the manpower to go back and challenge some of those, or the time to look at it, and as I say, assumptions basically drive cost estimates.

So that unless you are really independently looking at those, or doing some of the work like our people such as Mr. Crocker here did with the historic trends of the FYDP, then I think you are not able to give to the independent cost estimating effort, what is needed when you are tracking 80 multibillion dollar major weapon systems.

Senator PRYOR. If we have only 14 individuals in the Department of Defense, serving as a watchdog operation for the taxpayers' dollars and making sure that we don't get ripped off by the contrac-

tors, how many would you estimate in DOD are involved in the public relations program of the Department of Defense. [Laughter.]

Mr. BOWSHER. I don't know. I think we have given you that number in the past.

Senator PRYOR. I think it is in the thousands.

Mr. BOWSHER. Yes. Yes. Let me point out, I don't want to give a misunderstanding here. In the Army, they have 37 people working on independent cost estimates, the Navy has 18, and the Air Force has 93, and these groups do work together.

But when you are talking about that last independent look at the Office of the Secretary of Defense, you are relying on 14 people.

Senator PRYOR. We are talking about procurement of major multibillion dollar weapon programs and what Congress can do and what should be done within the services. Yet, we see on page 9 of your report, the second paragraph, the B-1B program office was told, by the Secretary of Defense to exclude certain items, for example, the simulator, from the B-1B program so that the President can certify the program costs would not exceed \$20.5 billion.

All right. What can we do about this? To me, it appears fraudulent. Where does the inspector general come in in this whole operation?

Mr. BOWSHER. This is one of your major problems, and that is guidance coming down from on high to keep an estimate under a certain amount. I think you also will see in our report somewhere else where an Assistant Secretary of the Navy gave guidance on what he thought should be in the shipbuilding estimates, and the professionals and the military over at the Ships System Command were so concerned about that guidance, pulling back on some of the estimates and reducing the estimates, that they wouldn't issue it.

But they did feel the pressure, naturally, that they had to come up with some guidance of their own, and so they did, and we as independent people are a little concerned about that guidance. I'm not sure that ever could have come out if it hadn't been for that senior person initiating that thing. Again, it was trying to get, I think, more program approved so that it looks like we can afford it. I worry about those situations.

Senator PRYOR. In these matters of guidance which, to me, look like a mandated form of guidance, does the inspector general ever look at these matters and question whether there is fraud perpetrated on the Congress and the taxpayers?

Mr. BOWSHER. I'm not sure whether they have been looking at this or not. We could do some checking with Mr. Sherick and find out if this is an area that they have been looking at and let you know.

[Information supplied for the record follows:]

The DOD Inspector General advised us that they have not performed any audits of weapon systems cost estimates reported in selected acquisition reports and congressional data sheets as a separate subject. In the past the IG auditors have performed audits of individual weapons acquisition programs that included the review of cost data which was also reported to the Congress. Some examples are the Army M109 Howitzer, the Navy Tactical Towed Array Sonar, and the Navy F/A-18 aircraft program. These audits disclosed that some applicable costs were not included in the program estimates.

The DOD IG has several audits in their second half fiscal year 1984 and fiscal year 1985 plan which would cover specific weapons acquisition program that are

also reported to the Congress. These audits will include the review of program cost estimates.

Senator PRYOR. I think it goes to the very nature of how independent that inspector general should be. I have long thought that the IG needs to be the most independent job that we have in our own Federal Government.

Mr. BOWSHER. Right, and I think the current inspector general at DOD, Mr. Sherick, has done a good job. He has shown a lot of independence.

Senator PRYOR. I don't care to even discuss the personalities of this, but the practice is very, very disturbing and troublesome to me.

One or two more points, here. I think this report has touched on another area. Relative to buying in, Chairman Roth mentioned this a moment ago. On page 89 of the CRS report, in the appendix, it states,

Indeed, it is widely acknowledged that program costs are often purposely underestimated, either because the contractors are lowering their cost estimates to win a contract in hopes of recovering costs on follow-on contracts * * *

This is known as buying in, and it goes on.

What incentive is there for a contractor to provide a realistic bid and for the DOD to provide realistic cost estimates to the Congress of the United States? What incentive is there?

Mr. BOWSHER. That is one of the toughest questions in this whole area, because there has not been the incentive, I think, in the past, simply because the overruns have been funded, and the Congress has eventually approved the programs as has the Office of the Secretary of Defense, when it has happened.

I think until people actually suffer a loss or some kind of a penalty for coming in low, including the services, or whoever on the Government side partook, you might because I think this is not just on the private side. In other words, I think the contractors are under a lot of pressure to be competitive, and I think you have got to have realistic programs and realistic contracts and estimates to compete if you are going to ever get rid of this cost overrun problem.

Congress has got to play a role in it that they just don't want it, in other words, they don't want to continue to fund all these cost overruns. But traditionally, even after a lot of testimony and hearings, the money comes.

So the incentives have been: Get the contract, get the original work, and hopefully we can work it out.

Senator PRYOR. I would like to go on the record as saying I think that is fraud, and I think a lot of people think it is fraud. I think the inspector general of the Department of Defense should immediately look into this matter, and I think it is gross negligence unless he does. I absolutely think that is the function and the role of the independent inspector general, and I hope that he and his office will immediately look into this, plus the area of the so-called guidance given on what to leave out of a cost estimate so that they can bring that estimate within a certain amount.

My final comment or observation, Mr. Chairman is, my first year here was 1979. During either that year or 1980 the Congress made

a very, very serious mistake, and you may disagree with me wholeheartedly, but we did away with a little agency of Government called the Renegotiation Board. I think that was a mistake. I think we need to reinstitute something, maybe not call it the same thing, but something like the Renegotiation Board.

I see all this audience out there, and I see some squirming. I don't know who these good people are who fill the room this morning, but I think the Renegotiation Board made people squirm, and today, I don't think we have enough of that, and I don't think that we have enough oversight.

Certainly, I don't think that we have any incentive built into the structure of procurement to make people play fairly and squarely with the taxpayers and with the Department of Defense.

By the way, I don't mean in any way to demean this report. I think it is a splendid report, Mr. Chairman, and Mr. Bowsher, I think, has done a real service to the Congress.

One final comment: Years ago when I was in school—I can't even remember that long ago—we read a little book called Plunkett of Tammany Hall. I don't know if you have read it. I require a lot of my good pals and friends and young people that I hire on my staff to read it. It's a very small book, and it's all about a Tammany Hall ward boss. One of the chapters was, "I seen my opportunities and I took them." I think we are seeing today a lot of defense contractors seeing their opportunities, and they took them. And they are taking us, they are taking us to the cleaners, and we are responsible for it in Congress, and yet we feel very, very impotent trying to deal with it.

I thank you for your report, and maybe something will come of this.

Thank you, sir.

Chairman ROTH. Thank you, Senator Pryor.

I think you hit on a very difficult, complex problem. I agree with you. I think maybe the kindest way to put it is that there has been a lot of acquiescence, not only on the part of the contractors, but frankly, on the part of the services, and over here in the Congress in the past. I think we cannot overlook that the way to get what you wanted in the budget was to underestimate. In addition we have got to correct our own house, as well as the others, because I don't think, to be candid, Congress is entirely blameless in this area.

I would like to go back, if I might, and ask you just a few more questions. Time is moving on, but I would like to, as I asked you earlier, have a breakdown of procurement personnel. I understand, for example, that you are considering taking a look at the European system of procurement.

Mr. BOWSHER. Yes.

Chairman ROTH. I think that could be valuable and helpful. I understand that much of their industry, of course, is Government-owned, so that the parallel may not be entirely there. But nevertheless, one of the differences I understand, or have read about, is that they don't get nearly as involved in the details of day-to-day operations as our Department of Defense tends to.

I wonder if we have a problem of micromanagement and not really doing the principal job of controlling overall costs and qual-

ity and so forth. I would urge and ask you to make this kind of study.

Frankly, one of my concerns is that—let me ask you this question: You have made some comments earlier about financial management—I wonder if you could tell us which of the three services is doing the best in bringing about reforms, how you would list them in order of effectiveness?

Mr. BOWSHER. In procurement?

Chairman ROTH. Yes.

Mr. BOWSHER. I don't think—it is mixed, and I think I can on the financial management, as I did, but I hesitate to do it with procurement at this time, Mr. Chairman.

Chairman ROTH. I will keep asking you that.

Mr. BOWSHER. All right.

Chairman ROTH. I think if we are really going to make reforms, we are going to have to name names and get into specifics.

Mr. DAY. Mr. Chairman, I would like to comment on that, if you want to make comparisons, it has been my observation over the years that Defense does a much better job than the civil agencies do in their acquisition process, excluding NASA, though.

Chairman ROTH. We held some hearings about 2 or 3 years ago that would, in many ways, support what you are saying, that "If we think we have problems here," but of course, you don't have the dollar figures in the civilian agencies, and that is one of the reasons we are all concentrating on DOD.

I would like to go back to the proposal that I am making. As I said earlier, I don't look upon procurement as a military function. It is obviously up to the generals and the admirals to decide what they require. But as to how to go about meeting those requirements, I think a Navy acquisition cost study performed in 1981 speaks to a service-wide problem with great clarity and eloquence, when it says:

The main thesis of this report is that we simply do not practice good business management in the Navy. The majority of acquisition practitioners are "engineers" who attempt to make business judgments lacking the proper training and background necessary to more enlightened decisionmaking. * * * The broadest aspects of the acquisition strategy are reviewed at very high levels to assure all sacred cows have been accommodated; virtually no one in the process analyzes the acquisition from a strict business management point of view.

It seems to me that if you are really going to make some real reform, you have got to put procurement in the hands of people who are procurement experts. I think some of the Navy programs that you described earlier where they had some success, and they were headed up by a military person, were due to the fact that the person in charge was interested in procurement and made himself an expert.

Mr. BOWSHER. That's correct. In other words, that was his career.

Chairman ROTH. The problem today is that you have this rotation, you have military people taking on the job of program manager for the 2 or 3 years, not as a goal or objective of their career, but as a step to bigger and better things. It seems to me that we ought to be turning over the acquisition to a civilian agency, an independent civilian agency within the Department of Defense that reports to the topmost level, and make sure that those people are well-

paid, well-trained, and that they secure bonuses for doing a good job as well as know that their careers will fail if they don't.

As long as we go the way we are going, we are really just nibbling, in my judgment, at the problem. We are not taking the substantive reform that is necessary. Until you have someone that is responsible for these contracts who feels his career depends upon it, and who has the know-how of dealing with the contractors, I think we are going to be sitting here doing this same thing year in and year out.

I wonder if you would like to comment on that kind of a proposal?

Mr. BOWSHER. Yes, Mr. Chairman. We have not done the work to comment fully on the proposal, but I think the problem that you are identifying and trying to address is certainly one of the major problems and one of the major contributors to this cost overrun situation, and that is the turnover of program managers, and not just program managers, but the top people in these program offices, and the qualifications that some of them have.

Some have qualifications, and others have very limited qualifications when they go into their jobs. A lot of them are coming off carriers, are coming off tactical squadrons, and they are assigned there for 2, 3, 4 years at the most sometimes, and they are hoping to get out and get on to a line command rather than just stay in the interior side of their services.

I think that if you are ever going to get these systems working, these systems brought in under their targets of schedule, costs, and technical performance, you have got to have qualified people doing it; you have got to have them there for long periods of time, hopefully the life of the effort in many cases, and——

Chairman ROTH. How many years did Admiral Rickover spend in his career of building nuclear subs?

Mr. BOWSHER. It was over 30 years, I think, and take the Polaris Program, you had Levering Smith under that program, who, I think, was there 15 years, maybe, something like that. So those were the continuities. In other words, the contractors knew they were dealing with the Government representatives, they knew what he was doing. They also attracted top level civilians and some military people into those programs that stayed for quite some time because they knew that the program was being run right and that it was going to be a success.

Chairman ROTH. They also knew those people had some clout in the system.

Mr. BOWSHER. Those people had clout. They could go up and see the CNO and the Secretary of the Navy whenever they wanted to. It was a major factor in the success of those programs. So I don't know whether a separate agency is an answer, but I think that something has to be done in this area, or you are not going to solve the problem of some of the other changes.

Chairman ROTH. My understanding is that a lot of foreign governments that have large defense programs use this kind of approach. So as part of your study, I do request that you look at this. Frankly, I agree with what you said earlier; namely, that something should be done about the constant rotation of program managers. I also agree with Senator Cohen, you must keep up with the

technology. Another problem is making minor modifications to weapon systems on a daily basis. Such changes should be authorized at a high enough level so that they are only done when it is of critical importance.

That is all I have for today, gentlemen. I appreciate your spending so much time here, and we look forward to continuing to work with you in this area.

Mr. BOWSHER. Thank you very much, Mr. Chairman.

[Mr. Bowsher's prepared statement, with attachments, follows:]

PREPARED STATEMENT OF CHARLES A. BOWSHER

Mr. Chairman and Members:

I am pleased to be here today to discuss the need for improved cost estimating on major weapon systems and credible reporting of planned and actual costs. I will be talking about cost growth, the Department of Defense's (DOD,s) cost estimating and reporting, and the underestimation of funding requirements in Five-Year Defense Programs (FYDPs).

Before getting any further into my testimony, let me give you some basic background information that illustrates cost growth trends over nearly a 10-year period. Chart 1 compares cost growth figures for the DOD systems in 1975, 1979, and 1983. Charts 2 and 3 compare the current estimates with initial and developmental estimates for weapon systems included in the selected acquisition reporting system with systems which are not included on Selected Acquisition Reports (SARs). Charts 4 and 5 present information on generic types of weapon systems, that is, land vehicles, missiles, and aircraft. You can see from these charts that cost growth is a continuing recognized problem which, while the subject of a lot of attention within the Pentagon and here in the Congress, still remains stubbornly resistant to control. The charts lead to the following conclusions: (1) cost growth remains a serious problem--it is not under control after decades of recognition, (2) it appears to be more of a problem in systems which do not get high visibility, and (3) overall, the cost growth problem is as serious now as it ever was.

On balance, today's military weapon systems acquisition process is almost always characterized by programs which are extended, exceed original cost estimates, and encompass fewer units than originally planned. DOD attributes most cost growth to quantity increases to fill original objectives or fill new requirements and inflation. We do not disagree that these two factors are significant contributors, but we would add that overoptimism in cost estimating transcends all the reasons cited by DOD for cost growth and, therefore, is the principal contributor to underestimates.

I will now proceed with the focus of the testimony and hopefully some suggestions we make today for improving the cost estimating and reporting process will assist this Committee in its oversight function.

DOD COST ESTIMATING

Mr. Chairman, at your request we made an in-depth review of the DOD cost estimating process on seven selected weapon systems. Our objectives were to look for instances where occurrences or factors causing cost growth should have been anticipated by the program office, the services, or the Office of the Secretary of Defense (OSD), but were not; or where such factors were purposely not considered; or where actions were directed to create the appearance of reduced program costs.

We found that using optimistic assumptions and inadequate consideration of independent cost estimates results in substantially understated cost estimates being reported to the Congress. We also found that the factors contributing to poor cost estimates included vague or conflicting cost estimating guidance, inconsistent program definitions, inadequate documentation of cost estimates, and estimates based on inaccurate or optimistic data. We determined that DOD could have improved its cost estimating and reporting on the sample systems by (1) using better guidance, assumptions, and methodologies for estimating and (2) making fuller use of the recommendations of DOD's independent estimating groups. We would like to briefly outline the major findings of our report for the Committee.

DOD NEEDS TO IMPROVE ITS
COST ESTIMATING GUIDANCE

The services have developed their own cost estimating guidance. In some cases, we found the guidance was vague and conflicting.

Guidance is vague and conflicting

Conflicting cost estimating guidance has a severe effect on program office estimates, particularly when these problems affect the definition of the system to be estimated. An example of this occurs between the OSD and Air Force guidance. DOD

Instruction 5000.33 indicates that some costs can be excluded from the program office estimate when funded by a separate budget line. In contrast, Air Force Systems Command Regulation 550-18 indicates that the program office estimate is to include all directed effort for which the program office has management responsibility, regardless of the source of funds.

The Air Force's B-1B bomber program suffered from the problem of conflicting guidance on what was to be included in the program. The Secretary of Defense told the B-1B program office to exclude certain items (e.g., the simulator) from the B-1B program so that the President could certify that the program costs would not exceed \$20.5 billion. The B-1B program office estimate excluded these items, but the independent Air Force and OSD Cost Analysis Improvement Group estimates included them.

Implementation of guidance is weak

DOD needs to improve the implementation of its cost estimating guidance. The weapon systems we reviewed provided illustrations of problems resulting from poor implementation, including

- a lack of definite and consistent cost estimate structure and

- inadequate documentation of cost estimates.

Cost estimates lack definite structure

Cost estimates must have a definite and consistent structure to be of use to decisionmakers. Such a structure would ensure that all costs associated with a weapon system are included in the estimate, and that the estimates consistently include all associated costs from one period to the next. However, we found that in some cases what is included in the weapon systems estimates is not consistent between estimates.

Lack of consistent program definition

DOD and service guidance establish and define the work breakdown structures to be used for cost estimates of major weapon system acquisitions. Despite this guidance, problems occur regarding what is included in the program definition, and the program cost estimates are not consistent.

An example occurred on the Army's Bradley Fighting Vehicle System, in which different structures were used to develop the 1979 and 1982 program cost estimates for the Bradley:

	(millions)
1982 program office estimate	\$13,358.7
1979 program office estimate	<u>7,742.0</u>
Difference	\$ 5,616.7

Both estimates are based on contractor data, but in 1979 the contractor used the approved work breakdown structure (that is, hull, suspension, power package, etc.). However, in the 1982 estimate the contractor's manufacturing costs were broken out by the contractor's internal reporting structure, not by the work breakdown structure used in the 1979 estimate. Thus, the two estimates are not comparable, and the program office cannot explain why costs increased \$5.6 billion between these two estimates.

Cost estimate documentation is insufficient

DOD and service regulations require documented cost estimates to allow traceability from one estimate to the next, allow verification, and maintain cost discipline. For example, Air Force Systems Command Regulation 550-18 states that the program office estimate has two main objectives:

- "(1) to establish and maintain program cost discipline and
- (2) to provide an unequivocal cost track."

Our 1972 cost estimating report¹ discussed problems in DOD's documentation of data sources, assumptions, methods, and

¹Theory and Practices of Cost Estimating for Major Acquisitions
(GAO-B-163058, July 24, 1972).

decisions basic to the weapon systems cost estimates. We developed nine criteria for effective cost estimating in that report and DOD concurred with these criteria. Eleven years later, we find the services' cost estimating guidance frequently meets our criteria and we found similar problems today as we found in 1972.

Recognition of program risk

Estimators should identify the risks, determine their probability, and increase the amount of the estimate by the magnitude of the risk. We found that cost estimators base their estimates on the information available to them at the time, and assume that the system they are estimating will not suffer from typical changes in schedule, funding, engineering, or the threat. Early estimates are often optimistic, or success oriented, and the risk factor included in them to provide for uncertainties is probably too low. Thus, when the early cost estimates are compared to later estimates, one typically sees large cost increases. This is illustrated by the SAR data.

Consistency of inflation recognition

DOD does not recognize inflation consistently in the weapon systems we reviewed. In some cases we found contractor inflation indexes were used to calculate inflation, and inflation was used as a device to hide other cost increases.

Use of contractor indexes

The December 1980 SAR (fiscal year 1982 approved program) for the Bradley Fighting Vehicle System reported a \$2,748 million increase in the baseline vehicle estimate over the September 1980 SAR (fiscal year 1981 approved program). According to program officials, most of this increase, \$2,541 million, reflected contractor projections of inflation. Those projections were significantly higher than the Office of Management and Budget's (OMB's) mandated indexes that were supposed to be used.

Inflation used to hide other costs

The treatment of inflation and the practice of some program managers to attribute cost increases to inflation was discussed in an April 1982 Comptroller of the Army report. The report states:

"Program Managers tend to define inflation in different terms. Often any change other than a programmatic change that occurs in a system is attributed to inflation.

The Army's Bradley System showed a \$2.5 billion increase because of inflation in its December 1980 SAR. A subsequent cost analysis by the program office indicates that the increase was not purely inflation, but included real cost growth of \$660.7 million.

Improvements needed in the
direction provided by DOD management

The basic assumptions used to develop a cost estimate have a tremendous effect on the final value of that estimate. Some of the systems we reviewed provided examples showing DOD directed cost estimators to use more optimistic assumptions. These assumptions related to contractor profit, the construction schedule, and allowances for uncertainties. For example, the Navy directed its estimators to reestimate the fiscal year 1984 Five-Year Shipbuilding Plan using optimistic assumptions. The result was a \$2.7 billion reduction in the cost estimate for the plan. Other examples of the required use of optimistic assumptions are: the use of optimistic contractor data, forcing cost estimates to fit within the fiscal constraints of the service budgets, and excluding relevant program costs.

DOD estimates are based
on inaccurate or optimistic data

DOD cost estimators told us the competitive nature of business drives optimistic contractor estimates. In addition, contractors may underbid to "sell" a program to the service and the Congress. Program offices sometimes base their estimates on this overly optimistic contractor data.

One example of this problem occurred on the Apache helicopter program where the accuracy of the contractor's cost data appears questionable. Problems and inaccuracies with the cost data were cited by representatives of the Army Comptroller, the program office, the Defense Contract Audit Agency, and Hughes. The program office used contractor cost data to prepare Apache cost estimates. This resulted in a significant difference between the February 1980 and September 1981 program office estimates. The \$1.55 billion cost increase in the later estimate was attributed largely to higher contractor costs.

Program cost estimates are forced to
conform to the budget

The services' total program cost estimates are prepared, reviewed, and validated under a ceiling--the President's budget. One example identified during our review occurred in March 1982 when the Defense Systems Acquisition Review Council production review on the Apache helicopter reduced the estimate by \$72.6 million to conform to the fiscal year 1983 budget guidance. To achieve the lowest estimate possible, DOD tends to use optimistic assumptions regarding technical, risk, development, and production problems, and schedule and design perturbations.

Relevant program costs are excluded

Relevant program costs are often excluded from systems' cost estimates through direction to cost estimators to omit

costs associated with changes to the original requirements. One example of these excluded costs was identified in the Bradley Fighting Vehicle System, where the September 1979 Bradley program office estimate excluded product improvements specified in the June 1979 approved system requirements. These improvements added \$740.9 million to the program 1 year later.

FULLER USE OF INDEPENDENT COST ESTIMATORS'
RECOMMENDATIONS WOULD MAKE COST ESTIMATES
MORE RELIABLE AND VALID

Although OSD and the services have established independent cost estimating groups to help ensure that cost estimates are more reliable and valid, efforts by such groups have not always been effective. We found independent cost estimators' estimates were not fully considered by DOD decisionmakers, and their recommendations were sometimes not accepted.

For example, an OSD analysis of the Bradley's September 1979 estimate pointed out that the fire control portion of the estimate could be understated by as much as 30 percent. No change was made to the estimate. The next year the Hughes Aircraft Company's estimate for the fire control system rose significantly--from \$597.8 million, to \$934 million.

RECENT DOD ACTIONS SHOULDHELP IF IMPLEMENTED

OSD and the services recognize the need to improve their cost estimating process, and as a result, they are continually taking steps to improve this capability. OSD, the Air Force, Navy, and Army each have efforts underway to improve their cost estimating practices. OSD efforts are part of the DOD Acquisition Improvement Program. The current efforts underway by the Air Force and the Navy, for the most part, appear to be a reemphasis and reinstitution of past measures. On the other hand, the Army has recently started what appears to be an extensive effort to improve its cost estimating with several new initiatives. The Total Risk Assessing Cost Estimate for Production, Program Management Control System, and Joint Independent Cost Estimating team are three of the major initiatives.

RECOMMENDATIONS

To resolve the weaknesses in the guidance, assumptions, and methodologies used to develop cost estimates, we recommend that the Secretary ensure that:

- OSD and service guidance is clarified and revised to resolve conflicts; and to require all costs associated with a weapon system be included in its estimates, all

estimates be fully documented, and to use appropriate methodologies in developing cost estimates.

--Program risks and uncertainties be fully identified in DOD cost estimates. Cost estimators should be directed to structure their estimating assumptions to consider proven historical cost growth drivers, such as technical changes due to engineering problems and added requirements, schedule changes, and funding instability.

--Inflation should be calculated consistently and in accordance with DOD procedures.

--Cost estimates be based on realistic assumptions rather than optimistic assumptions.

--Cost discipline be enforced by establishing the total program acquisition cost estimate developed for the production milestone as a not to exceed threshold. Program design, operational requirements, schedule, numbers of units, economically efficient production rates, and other critical assumptions should be firmly established. Changes to these requirements should be minimized and approved only on the basis of an urgent need, and only after considering the cost effect of such changes. A program in danger of breaching the threshold should be assessed to determine whether it should be

restructured, discontinued, or permitted to proceed as planned.

--DOD management fully consider independent estimates. The independent estimates should not be arbitrarily accepted, but the recommendations of the independent estimators should be considered and decisions not to accept them should be fully documented.

One way for the Secretary to address DOD's cost estimating guidance problems is by issuing overall guidance to the services--perhaps in the form of a "cost estimating handbook"--that would outline the criteria necessary to ensure that all costs associated with a weapon system would be included in the estimate, all estimates would be fully documented, appropriate methodologies would be used to develop the estimate, and estimates would be updated when significant changes occur in the program.

The Secretary should also develop measures that will ensure these guidelines are properly implemented. The implementation of the new and existing guidelines should be monitored by the Cost Analysis Improvement Group, a body within the Office of the Director, Program Analysis and Evaluation. In addition, the DOD Inspector General could periodically review the services' efforts to implement the cost estimating guidelines.

IMPROVEMENTS ARE NEEDED IN COST
ESTIMATE REPORTS TO THE CONGRESS

DOD cost estimates are reported to the Congress through SARs, unit cost exception reports, and the budget process. Major concerns have been expressed by the Congress and its oversight committees for some time over the accuracy, timeliness, and completeness of DOD's reporting. We found:

- SARs do not reflect the latest anticipated program acquisition costs,
- SARs do not show total planned acquisition objectives,
- important cost categories not reported in SARs,
- costs are not reported consistently in SARs, and
- unit cost exception reports have not solved the problem of a lack of current data reported to the Congress.

SARs do not reflect the latest anticipated
program acquisition costs

We found major differences between the officially approved program acquisition cost reported in SARs and the currently anticipated program acquisition cost projected by the program

office. These differences are the result of the time lag between preparing a SAR and submitting it to the Congress, and the requirement that SARs reflect the President's approved budget. For example, current Hellfire estimates do not include costs for a new missile seeker needed to meet Army requirements to increase the survivability of the Apache/Hellfire system. The Army canceled an earlier seeker development program, estimated at over \$1 billion, and is evaluating three lower cost options for the seeker requirement. If approved, a new seeker would further increase Hellfire acquisition costs. Seeker development costs were not included because they are not part of the officially approved program.

SAR's do not show total planned
acquisition objectives under consideration

The Army does not have a firm figure for the total number of Hellfire missiles it plans to procure. The SAR totals, therefore, do not report the ultimate cost of the Hellfire program. The total planned procurement quantity reported for the Hellfire has gone from 24,600 in March 1976, to 35,756 in March 1982, to 42,332 in December 1982, and 48,696 in December 1983. Hellfire project officials have been instructed to consider adding an additional year's production (about 6,000 missiles) to the total program during each budget cycle review.

In addition to the fact that the information in the SARs is not always reliable, useful, and readily understandable, it is also difficult to compare the information in SARs with that in other budgeting and accounting reports provided to the Congress. According to the Congressional Budget Office, for example, cost estimates for 13 systems in the December 1982 SAR excluded at least \$40.8 billion in program costs reported elsewhere to the Congress.

In times of constrained resources, it is more important than ever that the Congress and executive branch officials have the information they need to ensure that resources are being spent effectively and efficiently. Management and project reports, such as SARs, should be designed to help ensure that program objectives are achieved and costs controlled. To this end, planning and reporting go hand in hand: without a system of management reporting, planning is ineffective since the success of programs meeting their financial and program objectives cannot be evaluated, and the actions of those responsible for execution cannot be easily monitored.

These reports must be timely, useful, and readily understandable. Government financial systems should be designed to provide that information. Yet, today's financial systems--not only in DOD, but throughout the government--provide little of the reliable cost data essential to effectively monitor program execution, anticipate overruns, and provide a basis for future program and budget planning.

All too frequently, the results are the types of problems we have discussed here today--cost estimates which are unreliable, inconsistencies between budget requests and accounting reports, and an inability to compare planned budgets with actual costs and results. These problems exist largely because DOD and other departments and agencies generally do not budget and account on the same basis.

Budgets are requested and justified in terms of programs and projects, such as infant health care or a strategic missile submarine. Accounting and other financial reports, however, often focus on appropriations and categories of expense, such as travel or personnel, without relating them to the particular programs or projects for which the money was requested and approved. The absence of a consistent basis for reporting costs, both within DOD, and throughout the government, makes it difficult, if not impossible, to compare the costs of similar activities in the government. Effective management requires reports that compare planned versus actual costs for programs, organizations, and projects.

An integrated financial system that budgeted and planned on the same basis could produce accurate, comparable, and readily understandable management reports, such as the sample project report below.

A Sample Project Report
Construction Of A Strategic Missile Submarine

Project Status As of 10/3/83

Phases	Planned Cost	Actual Cost To Date	Estimate to Complete	Total Cost to Complete	Increase (+) Decrease (-) From Plan	Months Under (-) Over (+)
Research and Development	10	20	0	20	-4	+2
Testing and Evaluation	4	3	0	3	-1	
Design	10	11	0	11	-1	-1
Procurement	70	10	65	75	-5	+3
	<u>100</u>	<u>44</u>	<u>65</u>	<u>109</u>	<u>-9</u>	

Funding Status As of 10/3/83

		Appropriation		Obligations	
Number	Description	Date	Amount	Amount	Unobligated
XXXX	Research and Development	10/81	20	20	0
	Testing and Evaluation (FY 82)				
XXXX	Research and Development	2/82	1	1	0
	Testing and Evaluation (FY 82) Supplemental				
XXXX	Shipbuilding and Conversion (FY 83)	10/82	10	10	0
XXXX	Shipbuilding and Conversion (FY 83) Supplemental	4/83	1	1	0
XXXX	Shipbuilding and Conversion (FY 84)	10/83	70	35	35
	Totals		<u>101</u>	<u>66</u>	<u>35</u>
	Current Estimate		<u>109</u>		
	Increase (+)				
	Decrease (-)		<u>-5</u>		

This allows both managers and the Congress to quickly determine the:

- defined project phases, such as research and development;
- estimated resources needed to complete the project;
- estimated cost of those resources for each phase of the project;
- expected start and completion date, or milestone, for each phase;
- funding sources for the project (which may come from several appropriations).

As the project progresses, it is possible, using such reports, to determine if the project is on schedule, within budget, and requires additional resources to complete.

However, current government financial systems, including those in DOD, are incapable of producing such reports. It is time for a major overhaul of financial management systems governmentwide. Without such an effort, it will be difficult to correct many of the problems that characterize not only SARs, but other program areas that are of concern to the Congress. Current budgeting and accounting practices make it extremely difficult, for example, to compare health care delivery costs in the Veterans Administration, Public Health Service, and DOD. If the Congress is to effectively exercise its oversight and budgetary responsibilities, it is important that it have information that allows it to compare the costs of similar programs and operations governmentwide.

A financial management system that provided comparable, reliable, consistent, and useful information to support both management and congressional decisionmaking could provide the following benefits:

- the ability to compare planned with actual program and project costs,
- the ability to compare the costs of similar operations across the government,
- more accurate budget estimates based on actual past program and project costs,
- the ability to measure the input of cost and the output of performance, and
- increased accountability for the management of public funds.

Our assessment of the problems and our ideas on how we might proceed are discussed much more extensively in a two volume report currently in draft form. I appreciated the opportunity to meet with you to begin a dialogue on our proposals, and plan to schedule similar meetings with other members of the Congress and the executive branch. We hope this report will stimulate widespread discussion of these issues, leading to the consensus which will be needed if reform is to be successful.

SARs would be further improved and more realistic information would be provided to the Congress if the Secretary of Defense would ensure that:

--SARs report all relevant program costs (such as operation and support), use the most current data, and report costs in a consistent manner. In an exceptional situation where costs are excluded from the estimate, those costs should be clearly identified and the rationale for their exclusion explained.

--DOD disclose the total number of units it is considering for a program by providing a SAR footnote when that number is different from the approved program reported in the body of SAR.

--Unit cost exception reports simply do not report the same cost data as SARs, but report any anticipated cost growth that has not been included in the latest approved official estimate.

We recommend the Secretary encourage implementing the initiatives to improve the cost estimating functions within DOD and the services without further delay. Monitoring the implementation of the new and existing guidelines could be accomplished by the Cost Analysis Improvement Group, a body within the Office of the Director, Program Analysis and Evaluation.

UNDERCOSTING FYDP

Historical data shows that DOD's FYDPs are consistently undercosted. The dramatic increases in the defense program since 1980 and the perception that the cost of these huge increases may continue to be significantly understated has become a serious concern in the Congress. As you know, my staff recently completed an assessment to gauge the size of the undercosting problem, giving particular attention to the procurement of major weapon systems. This work was done in response to a number of congressional requests. In March we provided our results to you in the form of a briefing paper. I will highlight for the Committee the findings and conclusions of this study.

On balance, today's military weapon systems acquisition process is almost always characterized by programs which are extended, exceed original cost estimates, and encompass fewer units than originally planned. One of the major contributing factors is a systematic bias in DOD cost estimating practices which encourage optimistic cost assumptions while excluding actual cost experience and the reality of the budgeting environment.

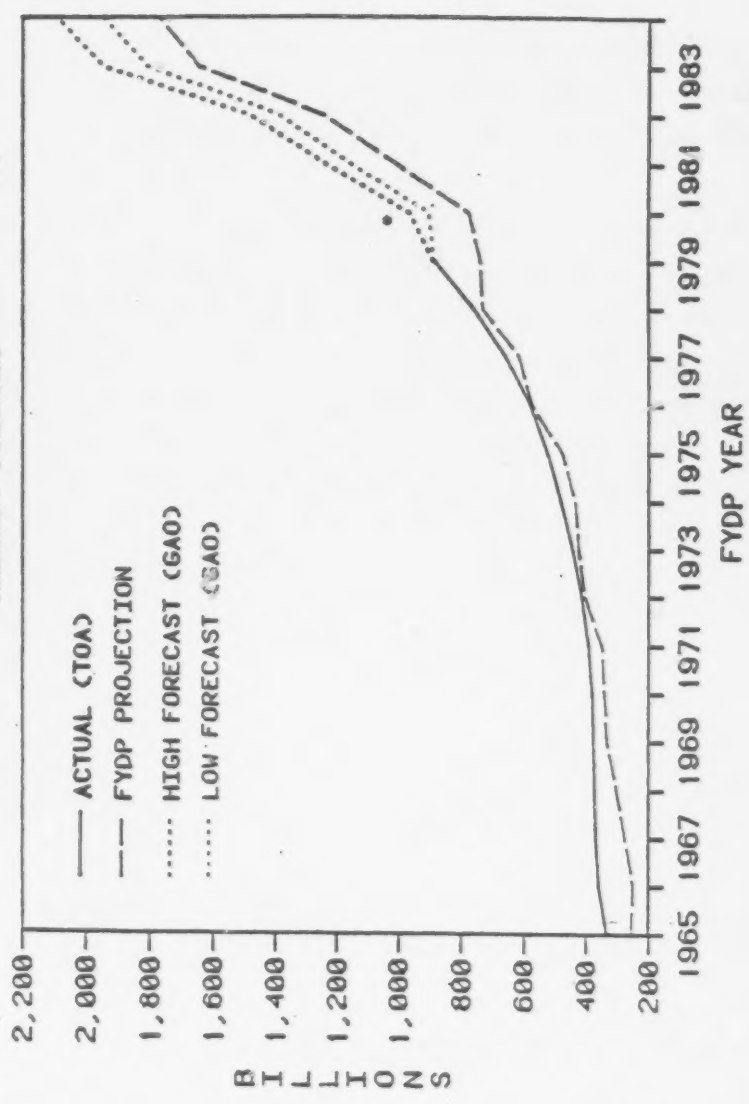
In analyzing the planned weapon systems cost versus actual total obligational authority (TOA) provided for 97 major weapon systems during the course of FYDPs from 1963 to 1983, we found

that the Congress must grant an average of 32 percent more obligational authority in an effort to execute the plans. Even with the additional moneys, the number of weaponsystems which DOD is actually able to procure is less than anticipated. As an example of the magnitude of the problem, I note the latest 5 year plan for which actual data is now available:

--The fiscal years 1980-84 FYDP. For the last 5 years, actual appropriated TOA exceeds DOD's original projections by approximately \$246 billion. Although it is not certain that the historical pattern of underestimation of funding requirements will continue, there is little evidence of a major change. As you can see in chart 6, TOA continues to exceed DOD's planning estimates.

CHART NUMBER 6

FYDP PROJECTED COSTS, ACTUAL (TOA) COSTS,
AND GAO FORECASTED RANGE OF COSTS
(CURRENT DOLLARS)



Much will depend on whether the estimates in DOD's 1981 through 1984 FYDPs are in fact more accurate than in the past. If these FYDPs, as DOD claims, are a reflection of better procurement planning and cost estimating, we should expect the level of TOA required to more closely approximate the FYDP figures and proposed weapon systems quantities and associated support to be attained within the planning period anticipated.

Our analysis identifies a pattern of underestimation of weapon systems costs that results in requests for stretch-outs and/or additional funds to fulfill plans. Additional funding is provided, but it is usually not enough or too late to purchase all quantities within original time frames. If this pattern of systematic underestimation continues, the Congress will likely provide 30 to 35 percent more funding and DOD will realize fewer quantities than planned.

Our analysis of the underestimate in FYDP's total funding shows a systematic pattern over 20 years. If significant management improvements are not realized, and historical trends continue, the fiscal year 1984-88 defense programs will absorb at least \$173 billion, to as much as \$324 billion more (in current dollars) than DOD has estimated.

DOD has stated that cost planning was often too optimistic in the past and despite efforts to address the problem, it continued to plague DOD through the late 1970s. In the February testimony before the Senate Armed Services Committee

and the Senate Budget Committee, DOD's Director of Program Analysis and Evaluation attributed overly optimistic cost estimates to five factors that consisted of a failure to

- budget properly for certain one-time costs
(e.g., initial spares),
- procure enough support equipment,
- buy equipment at efficient rates,
- fund planned modification programs properly, and
- provide realistic forecasts of future inflation.

To compensate for these financial management failures, DOD testified that its fiscal year 1982 budget amendment and fiscal year 1983 budget submission included corrections for many systems. Therefore, its requests were higher than the cost forecasts of the late 1970s indicated would be required. DOD went on to state that in addition to correcting inherited problems, it had put into place several changes to significantly improve its cost estimates. One change has been a greater emphasis on independent cost estimating.

To get independent cost estimates, the Cost Analysis Improvement Group was created under OSD. The 1984 DOD Authorization Act requires independent estimates to be submitted to the Secretary of Defense and considered in decisions regarding major weapon systems. In the past, however, justification has often been made for not accepting the independent estimators' recommendations. Such justifications, for example, were made in the course of a number of missile development programs, including the Copperhead, Tomahawk, Harm, Sparrow, and Maverick.

We also found that the assumptions and formula used by the independent cost estimating groups are similar to those used by the program offices. Our analysis indicates that as a result the cost estimates of the independent cost estimators appear to suffer from a tendency toward overoptimism, although to a lesser degree than program offices' estimates.

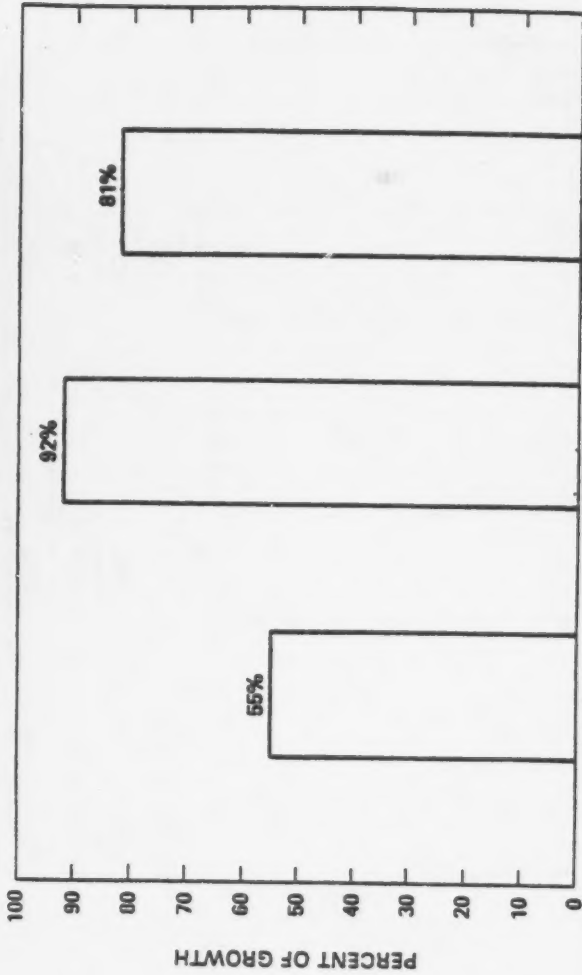
Future improvements in overall program planning and efficient execution depend heavily on better cost planning and management. The proof will be in the effect on overall defense program costs and execution. This again emphasizes the need for an integrated management system.

As I stated earlier, and I reiterate here, much will depend on whether the estimates in DOD's 1981 through 1984 FYDPs are in

fact more accurate than in the past. If these FYDPs are a reflection of better procurement planning and cost estimating, we should expect the level of TOA required to more closely approximate the FYDP figures as our first indicator. A second, and perhaps most important indicator, will be the degree to which defense programs are fulfilled within planning estimates. This is most likely to be achieved if the Secretary of Defense and the Congress have more accurate cost information on DOD's 5 year programs. Better cost assessment is the key to making the right tradeoff decisions today on what will shape our long-term defense policy.

CHART NUMBER 1

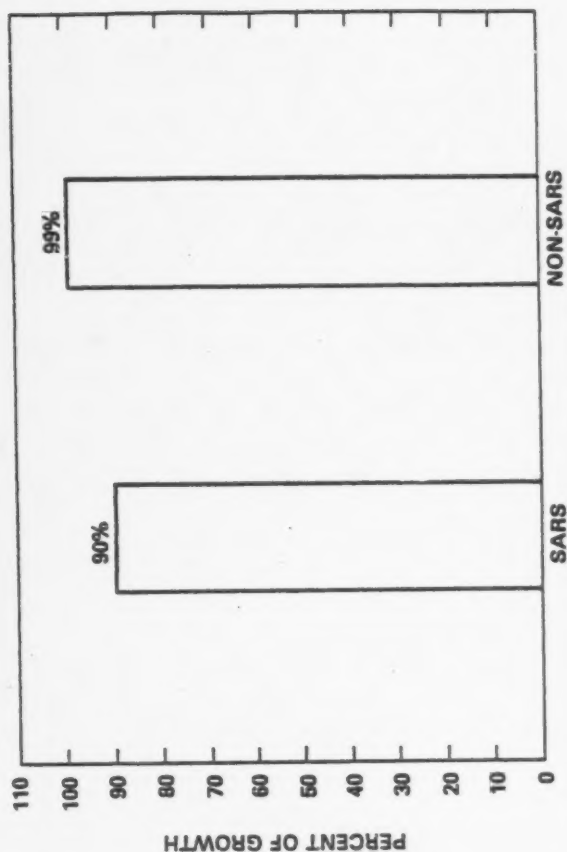
DOD REPORTED COST GROWTH FROM DEVELOPMENT ESTIMATES FOR SELECTED ACQUISITION REPORTS



ACQUISITIONS:	41	48	73
CURRENT ESTIMATE COST:	\$155	\$256	\$618
DEVELOPMENT ESTIMATE:	\$100	\$133	\$340
GROWTH:	\$55	\$123	\$278

(ALL DOLLARS IN BILLIONS)

**INITIAL ESTIMATES COMPARISON OF SAR/NON-SAR COST
GROWTH RATE AS OF SEPTEMBER 30, 1983**



	SARS	NON-SARS
ACQUISITIONS:	73	86
CURRENT ESTIMATE:	\$607	\$195
INITIAL ESTIMATE:	\$319	\$ 98
INITIAL GROWTH:	\$288	\$ 97

(ALL DOLLARS IN BILLIONS)

CHART NUMBER 3

**DEVELOPMENT ESTIMATES COMPARISON OF SAR/NON-SAR
COST GROWTH RATE AS OF SEPTEMBER 30, 1983**

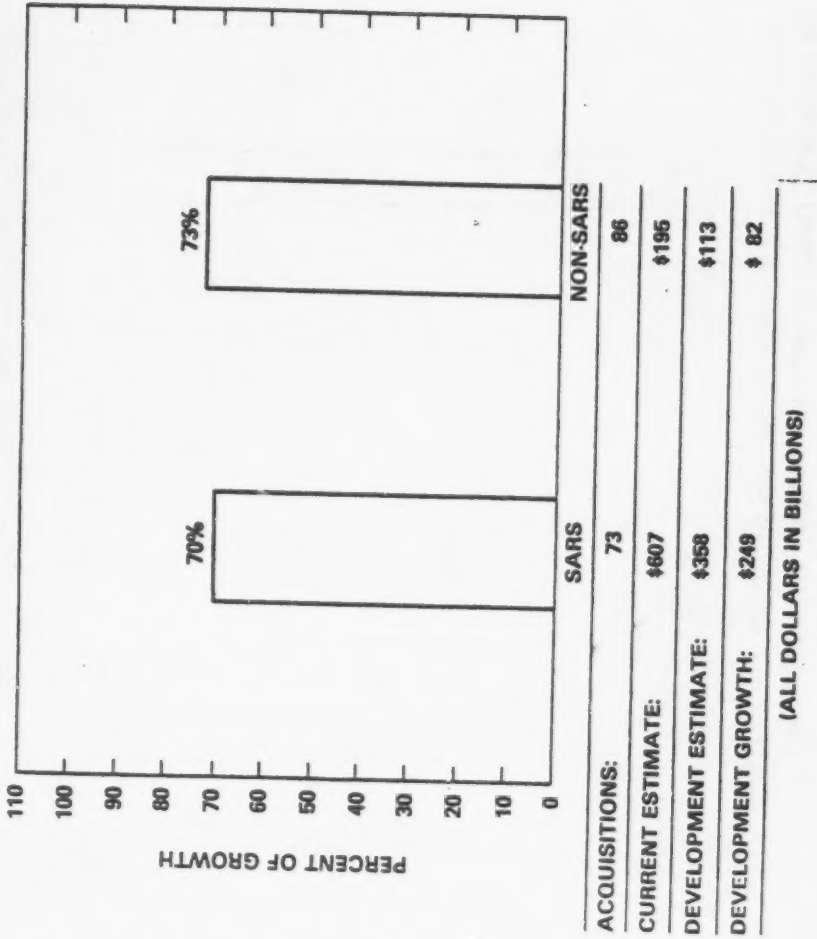
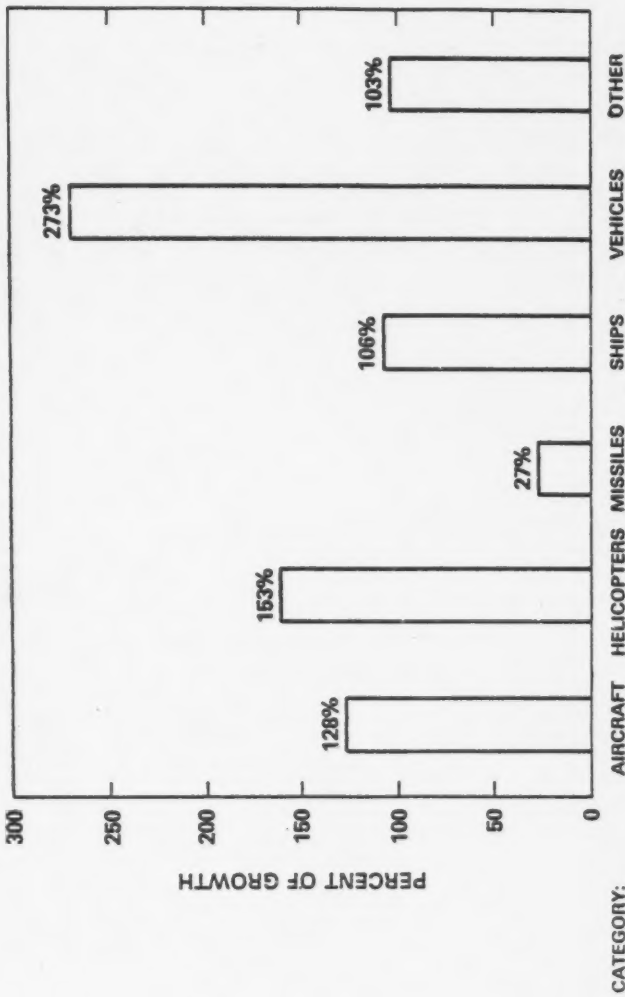


CHART NUMBER 4

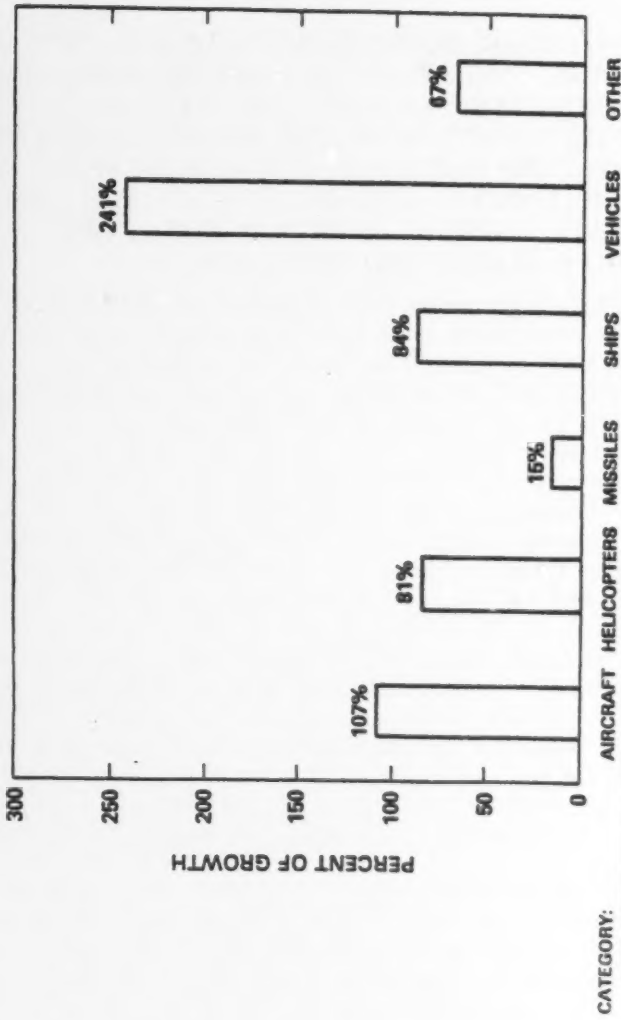
PERCENT OF INITIAL ESTIMATE COST GROWTH BY
CATEGORY OF WEAPON SYSTEM AS OF SEPTEMBER 30, 1983



(ALL DOLLARS IN BILLIONS)

CHART NUMBER 5

**PERCENT OF DEVELOPMENT ESTIMATE COST GROWTH BY
CATEGORY OF WEAPON SYSTEM AS OF SEPTEMBER 30, 1983**



(ALL DOLLARS IN BILLIONS)

Chairman ROTH. I would request that at this time, Mr. Quetsch, the Deputy Comptroller for the Defense Department; Major General Chubb, Major General McCall, and Acting Assistant Secretary Pyatt proceed.

TESTIMONY OF JOHN R. QUETSCH, PRINCIPAL DEPUTY ASSISTANT SECRETARY, ASSISTANT SECRETARY (COMPTROLLER), OFFICE OF SECRETARY OF DEFENSE; MAJ. GEN. MELVIN F. CHUBB, DEPUTY CHIEF OF STAFF, SYSTEM DEVELOPMENT, AIR FORCE SYSTEMS COMMAND; MAJ. GEN. JAMES F. McCALL, COMPTROLLER, DARCOM, DEPARTMENT OF THE ARMY; AND EVERETT PYATT, ACTING ASSISTANT SECRETARY OF THE NAVY FOR SHIPBUILDING AND LOGISTICS

Chairman ROTH. Gentleman, I welcome each of you to this hearing. We have received your written statements which I have read, and accordingly, they will each be included in the record.

I would, therefore, ask each of you to summarize your statement, I would hope, in 3 or 4 minutes, so that we can have more time for a question and answer period.

Mr. Quetsch, do you want to begin?

Mr. QUETSCH. Thank you, Mr. Chairman.

Even before Senator Cohen used the analogy, I must say I was sitting back there thinking about R&R when we came off the line in Korea and went to Japan, when all of a sudden everything became very clear.

I trust that the committee will treat me with the same enthusiasm that the ladies in Japan did, and with a little more sincerity. [Laughter.]

Rather than summarize my statement, which is really a litany of what we have done to try to attack the problems that concern you, Mr. Chairman, let me briefly address Mr. Bowsher's statement and then answer, perhaps, some of the same questions from a different point of view.

Basically, he drew on three GAO documents as you know:

One, on estimating the cost of weapon systems; the second, his own and perhaps closest to him on managing the cost of government; and finally, another briefing by the GAO on the 5-year defense plan and the underfunding thereof.

I think a careful reading of GAO's recommendations in the first report make it clear that, essentially, what they are recommending is that we do more or do better, or both, of what we are already striving to do, and with what we think, some considerable success.

I was happy to see, incidentally, that the press release on that report, which has been in draft since last fall, while continuing to indicate differences with DOD, presented a somewhat more balanced and sympathetic approach than the draft we reviewed at that time.

I wish it had given more recognition—and you have tried to elicit that in your questions to Mr. Bowsher—to the progress that we have made, both in emphasis and in results.

We have not had time to review Mr. Bowsher's broader plans, and most of them are out of our purview. We certainly are well aware of the problems that we are trying to solve with his sugges-

tion in that area for governmentwide improvements, and we sympathize, I am sure, with a lot of those goals, and probably will with a lot of his proposals.

The briefing on the FYDP reflects some of the same deficiencies as the report on weapons costs, that is, it reports what we all know: the costs are rising.

It fails to identify in terms of any meaningful weight or reason why they are rising. It assumes, particularly the projections forward, that the same factors which have caused the underestimates or cost overruns—and they don't know any more than we do whether these were bad estimates or bad execution—whether those same conditions will prevail and influence costs to the same extent in the future.

In the historical trend, there were considerable differences, but in their projection, everything is going bad.

So we do feel a little bit beleaguered, particularly when our main job is not to come up to defend ourselves, but to do our job.

There are real competitive resource allocations within the Department, within the Government overall, that encourage a natural human tendency to understate costs.

There is no doubt about it. That is what so many of our review processes, our independent cost estimates, our disciplined techniques are intended to get at, because as long as there isn't enough money to go around, and there never will be, and if there were, nobody would admit it, the people are going—

Chairman ROTH. Let me ask you a question: What are you doing about it? What are your specific steps to correct that?

Mr. QUETSCH. There are many. Every review level is an attempt to reconfirm or modify the assumptions and to correct the omissions of levels below it. The independent cost estimates which we instituted ourselves, which have now been enshrined in the 1984 Defense Authorization Act, and we are required to certify that we have them before we can award contracts and so forth, again, somebody else adopting what we have done and perhaps pressing us to do a little more than we should.

Those are major ingredients. Others are the things that the service representatives here today may—

Chairman ROTH. Let me ask you again, because frankly, what you are saying is what every representative comes and says here: "We are aware of the problem; we are working on it; improvements are being made."

That was said in 1975; it was said in 1978; it was said in every administration, and I am not attacking this administration or any other. But I am concerned because I don't see the proof in the pudding.

It is very easy to say that each level is reviewing the problem, whatever it may be, and yet GAO which, whether you like it or not, has the confidence of Congress and the public, has indicated that they have seen nothing that is going to substantially correct it.

So what beyond this are you doing? Have any Pentagon officials, or contractors been penalized for underestimating? Have their contracts been canceled? Can you list them for me?

Mr. QUETSCH. Yes, sir, but I cannot give them to you today.

Chairman ROTH. I would ask you to submit them in writing within a week.¹

Mr. QUETSCH. Contractors have been suspended for fraudulent contracts.

Chairman ROTH. I am not asking for some of these small contractors along the way. I am asking, has any major contractor ever been seriously penalized for underestimating costs or has any ranking member of the Department of Defense had his career affected by something similar?

Frankly, I have some sympathy, because I understand there is a lot of pressure from Congress, as well as political pressure from within Defense, to do otherwise.

What I am really interested in is not a reiteration of a lot of generalities. I want to know concretely what we are trying to do to correct it.

Mr. QUETSCH. I think our statements will show that. Again, I don't want to have to run you through them all now, but there are many, many things. But you will still hear about it 5 years from now, and you will still hear about it 10 years from now, because human nature is involved.

Chairman ROTH. We are not asking for perfection; we are asking for improvement.

Mr. QUETSCH. That is right. I think if GAO had to do what we have to do, they wouldn't enjoy the confidence that they do when they sit at this table. And that is not a criticism of GAO, but they have never had to live with these estimates.

As a matter of fact, if you look at the growth in GAO and compare it with the costs, you would be accusing them of cost overruns. In trying to give you achievements we have made, I would ask you to address yourselves to the chart on the left.²

This reflects the annual rate of cost growth in then year dollars, adjusted to remove the effects of changes in quantities of weapon systems procured and economic inflation, for the whole range of systems in the SAR's. The dotted line below it reflects what we call the base year dollar cost growth curve, that is, adjusted to remove the effects of changes in quantities of weapon systems procured and all inflation.

We did not—if you want me to, I can get up there and dramatize it. But what I am—

Chairman ROTH. I want you to conclude your remarks so we can get to the others and then get to the question and answer period.

Mr. QUETSCH. Simply stated, that hump is when we had inflation, one, and were experiencing growth because of inflation. I am not saying that is the only reason for it, but it coincides in time; and two, the correction of it by this administration by a policy that everybody is promoting in this room of realistic budgeting.

It is that growth, that correction of the past misestimates that we are largely being criticized for at this table today.

If the GAO had broken down their reasons for cost increases in any kind of way at all, that would be visible. These are the comments that we have made to the GAO. Again, they have rediscov-

¹ The information referred to was not received prior to publication.

² See chart on p. 59.

ered what we call new, and our argument is not really with the facts that they discovered, but with the likelihood that we can affect our reform.

We are trying within the constraints on us.

Thank you, Mr. Chairman.

Chairman ROTH. Do we still have staff here from GAO?

Are they still here?

Mr. CARTER. Yes, sir, we are here.

Chairman ROTH. Would you care to make any statements?

Mr. CARTER. Well, the escalation factor is one that is a question and a difficult one to explain. There are actually two factors involved there. One is the cost increase because of actual escalation rates that are higher than the rates that Defense has had to use. There is another factor of escalation, and that is the escalation rate associated with program changes. I'm not sure if that is reflected in these charts. That is the inflation that you would pick up because of program change based on DOD's rates.

There is another factor, and that may influence the end of this period, toward 1983, they have a lot of new systems coming on. You are not going to see a lot of change in its new systems.

If you take an analysis of the systems that you see between 1978 and 1983 in the SAR's, you will find 35 reports that are reported in each of those years. You will find that there is a significant cost growth over that time period—I think it is about 175 percent—if you don't exclude that program escalation but you do exclude changes for units and changes for escalation above the DOD rates.

Chairman ROTH. All right. Thank you.

General Chubb, Deputy Chief of Staff, System Development, Air Force Systems Command.

General CHUBB. First, Mr. Chairman, I would like to invite you to come over to Andrews and spend a couple of hours with us.

I think I could show you some things that would impress you in methods we use to control cost growth.

Let me come back to the Affordable Acquisition Approach study we conducted. I want to give you the bottom line of that study. The most important thing is program stability. If you have changes in views, changes in costs, changes in budgets, that lack of stability just tears you up on programs. No matter how good an estimate a financial analyst provides, the estimate won't be any good without stability.

So what we have tried to put most of our emphasis on in the last 2 years is what we refer to as baselining. You referred to it as "Freeze the Program."

We started with the B-1B in 1982. We are now up to 67 programs and want to carry that up to 100 programs by 1985. I think that is the one best thing we could have done, in fact, has proven to be the best thing we can do to really hold down and stabilize cost growth.

Establishing a baseline lets the estimator estimate the right program. We have had a problem in the past when the estimator has based the program estimate on the wrong program content. And then the program content changes every year compounding the impact of all the other factors you have talked about.

Baselining also makes everyone determine upfront what they want out of that weapon system program so Congress, OSD, and everyone else involved has an understanding of what we want.

We are impressed with what baselining does. We are going to continue to put emphasis on it, and will continue to expand its use. We think it is a success story.

Talking about cost estimates, we are adding cost research work and trying to improve our modeling. We are doing everything we can so our program directors have every bit of data required for a good cost estimate. We have accelerated this initiative over the last couple of years. Multiyear procurement is a success story but not just for the savings highlighted by the GAO. Savings are important, but what multiyear really does is stabilize the program.

That is the key—program stabilization. There are several other things we have done to reduce cost growth: Program director accountability, "should cost," trying to buy at economic rates; they all pay off.

Those are big items which lead to that program stability we think is so important.

In the question and answer period, I would like to address two other issues: I ran the B-1B when the \$20.5 billion baseline was developed, and I can tell you about that, if you desire.

I also have some views on how we in the Air Force handle acquisition careers from the time an officer comes in as a lieutenant until the officer is a four-star general.

Many officers spend almost their whole career in acquisition, and we think these professionals are very talented and do a very good job.

Thank you.

Chairman ROTH. All right. I do want to say, in the area of baselining or freezing costs, I have heard some encouraging reports on what the Air Force is trying to do. I congratulate you on that.

General CHUBB. Thank you, sir.

Chairman ROTH. General McCall.

General MCCALL. Sir, it is a pleasure to be here. As the Comptroller for the Army's Materiel Readiness Command, I have, for 4 years, been responsible for the cost estimates, and for 11 years before that I was in financial management.

I would like to reemphasize our concern for program stability. In my statement, I make reference to our program management control system which is our best effort to take out unnecessary change, or sometimes characterized as frivolous change, out of the system and it is frankly patterned after the Air Force system.

We went to school under General Chubb's predecessor, back in 1981, and we think we have a structure that provides the insulation and protection for the project manager so that he has a firm contract, knows exactly what he has to do, and goes out and does it.

We have a target of 26 systems to be so baselined, and we have had the opportunity to baseline 17 so far. If I could, in my last few minutes, focus on the people dimension, we have talked about the cost estimators and their role.

I have 350 such people in the Army. One hundred and twenty of those people are assigned to the project mission and work in the

small cells in their offices, the remainder are in the offices of the commodity commands.

At any given moment, when we will have 120 people working on the project mission, estimate, we will have a like number working on the independent cost estimate.

I think the committee needs to understand there are many more than 14 or 39 or how many other people working on independent estimates at any given time.

That estimate is truly independent, travel a separate track and is presented at every level as an independent assessment.

Finally, on the question of rotation, we have tried to attack that by our military acquisition management program, covered in my statement, and I will be happy to entertain your questions, where we had started our officers at the grade of captain, those that want to pursue an entire career of acquisition management, and proceed in that track for the remainder of their military career.

I will be happy to take your questions, Senator.

Chairman ROTH. Mr. Pyatt.

Mr. PYATT. I would like to come back to a statement made earlier this morning on a comment about the Department of the Navy guidance on shipbuilding. I was a participant in the development of that guidance. At this time, I was also working on the Aviation Program.

Our view was that the marketplace was changing substantially. We should walk into it and take advantage of those changes. Since the time that guidance was prepared, the program has been executed.

I would like to just briefly recount the history of the program.

In the shipbuilding world, the guidance as implemented resulted in a reduction from the initial budget presentation of about \$430 million. That budget was presented to the Congress and went through the authorization and appropriation process during actual execution, and it is now complete.

For all the shipbuilding and a good portion of GFE, another \$513 million was saved. Basically, our determination that the market was changing and that there were budgetary pressures that had driven ships up in the past was accurate and our management action resulted in reducing the Defense Department obligations by about \$946 million.

I think that is significant. I think that reflects the fundamental role management has to play in controlling costs.

In the Navy, our interest has been primarily in execution during the last 3 years. We came in with the challenge to rebuild the Navy, and we recognized that to get ships built, we would have to maintain the confidence that our money was being spent wisely and we would have to obtain as much value as we could.

In aviation, the fiscal year 1983 program was executed \$570 million below the budget presented to the Congress. So execution is one aspect of cost control.

There are many others. Independent cost estimating is fundamentally important. I have been a supporter of it for my entire professional career. It is absolutely mandatory, when you are making a decision on a major program, to have more than one view about what it costs.

We do it in the Navy at all of our management reviews. Mechanisms that we have tried to implement during the last 3 years, which Mr. Bowsher mentioned this morning include the independent budget officer, who can assert some independence in the management chain for financing, and maintain oversight under the independent reporting scheme.

We now have mandatory 4-year tours for program managers; tours that have to be approved by the Chief of Naval Operations, Chief of Naval Material, and Secretary of the Navy.

It is one attempt to bring some stability into the management process that we all know is necessary.

In the contracting part, we have put more people into the field observing the work of the contractors and inspecting their work, making sure that we get what we pay for. Numerous transactions occur, and we all know that the world is not perfect and things don't always happen the way we would like to see them.

Competition—Navy competition is up. We think this is, again, a fundamental precept of the changes that have been implemented in this administration. It is the primary means of saving money and brings more firms into the Defense sector.

Program stability is absolutely fundamental to maintain cost control. More stability of design, is important. Major changes in Navy programs have to be approved by the Secretary or the CNO. We are attempting to slow down the rate of change. Every time we make a change, the learning changes on the production floor; folks don't quite know how to do those things anymore, and you lose a bit of efficiency. So it is really a fundamental management issue that you have to stay on all the time.

Multiyear, we have tried to present multiyear programs. I have been disappointed. I have been disappointed at our inability to put together the contractor's programs that should have higher savings. Our best experience is with a sort of a multiyear program on two carriers, which we presented to Congress with a projected savings of \$750 million. It looks like our actual achievement is going to be more on the order of \$1.1 billion.

Controlling costs, I think, is execution, and controlling costs is one of the things we have to do and that we focused on during the last 3 years. I think we have made very significant progress.

Chairman ROTH. I think it is fairly easy to agree on the principles that are necessary to reform the system. I think the problem is how do you get those that are responsible for managing the contracts to follow through?

The thing that always bothers me when we hold a hearing of this nature is that no one ever wants to admit anything is wrong; everything is always all right. Yet we have our independent auditors go in, and they tell us they don't see the necessary reforms taking place.

Let me ask you, Mr. Pyatt. You talk about the importance of stability. What are the actual, concrete steps that you have taken to stop the kind of changes that have helped to bring about overruns in the past?

Mr. PYATT. I think there are two forms of stability; one is program stability so that you can put together contracts and negotiate and execute them, and in the last 3 years, our major acquisitions

by past standards, I think, and by anyone's standards have been pretty firm, and they have been pretty stable.

Chairman ROTH. How did you accomplish this?

Mr. PYATT. In the budgeting and programming process, we just didn't change.

Chairman ROTH. Have you made any change as to who has the authority to make a change? Have you reviewed that procedure?

Mr. PYATT. In the programming and budgeting process, anything that gets sent to OSD is approved by the Secretary of the Navy. In the other elements of change and what I call—

Chairman ROTH. Sure, but let's talk internally within the Navy itself. Say you receive a ship modification request. Who authorizes such modifications—have you made any changes to your command structure regarding that authorization process?

Mr. PYATT. Yes. We have instituted a process we call the program management proposal wherein all changes that require cost changes will go to the Secretary of the Navy, beginning with the fiscal year 1984 programs which are now being executed.

Chairman ROTH. For example, the GAO report shows that the cost estimates on the multimillion dollar LAMPS MK-III helicopter were so poorly documented and managed that GAO could not track clearly how cost estimates on the program were developed and used.

Mr. PYATT. In our response to that charge by the GAO, which was somewhat puzzling, we acknowledged that the LAMPS program has been the source of major problems since the day it began in 1976 or 1977.

Two program managers have been fired during its course. We think we have been able to achieve stability in the design and in the production and, in fact, production costs are coming in below the budget.

It has been a significant problem to achieve the goals that we set out to achieve. The threat has been changing and the design of the aircraft has been changing in the development process.

Chairman ROTH. A few moments ago you were talking about stability. Why haven't you reached stability in that program?

Mr. PYATT. We have now.

Chairman ROTH. Starting when?

Mr. PYATT. With the 1983 projection.

Chairman ROTH. No changes before then of significance?

Mr. PYATT. Nothing of significance.

Chairman ROTH. And you think the cost estimates are—

Mr. PYATT. I think again, this year, with the budgets that have been presented to the Congress, we will be able to come in below.

Chairman ROTH. Do we have the person who reviewed that from GAO? Do you have any comments?

Mr. CARTER. Our report indicates what we found. We had difficulty in trying to track the estimates through.

Chairman ROTH. Is that true to the time of your audit? Has it improved this past year?

Mr. CARTER. Unless it improved this past year. At the time of the audit, it didn't. In that particular case the Navy used an iterative type of estimating on the LAMPS, and we asked them for the estimate that all these iterations were based on.

We were told they couldn't get it to us, until we finally went back to DOD for their comments, and then they provided the estimate to us at that point.

We had difficulty in tracing their estimates all the way through. It may be true that it changed in the last year. But it wasn't true before.

Chairman ROTH. When did you complete your study?

Mr. CARTER. Last March.

Chairman ROTH. This year or last year?

Mr. CARTER. Last year.

Mr. PYATT. I will quickly agree, and I think I just did, that during the development of the LAMPS, there was substantial turbulence in the program, part of it induced by the executive branch, part induced by the Congress and part induced by the threat.

We had a lot of trouble with that program.

Mr. DAY. I would like to add, Mr. Chairman, that the statement about stability by Mr. Pyatt, I think, brings it out rather clearly, the LAMPS program is at least 15 years old.

There comes a time when you do attain stability, and that usually comes with age.

Chairman ROTH. If I understand what you are saying, it is that if stability is ever going to come in a program, the 15th year is not particularly encouraging?

Mr. DAY. It is not dramatic or encouraging, no.

Chairman ROTH. All this bothers me. You know, you can go back to this 1981 study where it is admitted that a number of changes need to be made, and frankly, I admire any service with the guts, and courage to come forward and say, "We have some problems and we are trying to correct them." But time and again, the people sent up end up in a confrontation with the GAO and say, "There are no problems."

But you have yet to, I think, persuade Congress or the public. Certainly, when you read in an in-house Navy acquisition cost study that, "The main thesis of this report is that we simply do not practice good business management in the Navy," it shows that we have problems.

I am not interested so much today in trying to fix the blame or criticize what has happened in the past. What we are interested in is trying to institute some reforms that will correct this in the future.

As I said to General Chubb, I have been encouraged by some of the things I have heard about the Air Force, not that I think they are perfect. I don't want them to get that impression.

But at the same time, I am impressed that GAO is saying that your financial management is the best of any of the services, and I think that is the sort of thing we want to see.

Let me ask you some questions about some of the basic problems as we see them.

One of my concerns is the fact that we have no basic standard or guidance from the Department of Defense with respect to cost estimating. I intend to write the Secretary and see what we can do in this area. But would any of you gentlemen care to comment? Is there any reason why this would give you any problems?

Mr. QUETSCH. If I may answer that, Mr. Chairman, I know you don't want to see the list, so I won't show you the list of directives that are out, but there is one technique.

Chairman ROTH. I know you have so many regulations over there that you could fill the room with them. I am not interested in that.

What I am asking is why can't we standardize the process for cost estimating? I know you can—

Mr. QUETSCH. We can force it into a standard mode, a selected acquisition report like Senator Cohen was talking about, but there are underlying realities which are very different.

The whole system is basically seeking to identify the unknowns, or what Mr. Bowsher refers to as the unknown unknowns, even, which people who are not cost analysts and who are not program managers can operate on and can say, "Aha, you don't know what is going to happen here." That is an unknown or an unknown unknown, so we will take over and estimate it for you. Those are going to differ in every situation.

Whether you use a parametric type of estimating or some other kind based on accounting data, or the weight of each of those in your system is going to vary according to the quality of your data, the timeliness of your data, the stage of your system, how much of a jump it is from the last time and so on.

What we need to do is strike a balance at the OSD level and let it be interpreted further and defined further as it is applicable to the programs, say, to the Sea Systems Command or the Naval Systems Command or the Tank and Automotive Command, that they could add more intelligence to the general guidance we give them.

That doesn't resolve, as you say, the proliferation of instructions. The totality of those is quite comprehensive and much more meaningful to the poor fellow at the bottom who has to make an estimate and doesn't have to force it into some rigid, bureaucratic, top-down set of blocks, columns and stubs on a form, which then come back to you as unintelligible.

Chairman ROTH. As a practical matter, Mr. Bowsher, in his testimony, showed some reports that I think are understandable. I just can't buy the idea that you can't have some standard operating procedures with sufficient flexibility so that they can fit different needs. The statement that every weapon system is unique just shows me that we don't have modern management systems over there. I am sorry. I don't agree with you, and sure, there has to be some flexibility, but there is no way to compare the cost of different weapons if we don't have any standard approach. That means, in turn, that Congress is unable to evaluate the various proposals via a standard system and decide how the priorities should be established.

So I suggest that this is something that ought to be studied. We have a Department of Defense report on this, which doesn't surprise me.

Let me ask you a question I raised with Mr. Bowsher. Is there any reason, perhaps, not to have a range as part of the cost estimate? Let me reemphasize. I understand that this is an extraordinarily complex matter and it is very easy to sit up here and try to oversimplify; that you are on a cutting edge of new technology and these are multibillion dollar programs that are difficult to esti-

mate. But would it be helpful or more practical to have a range of low and high built into the various estimates based on how you see the risks?

General McCall.

General MCCALL. Sir, I think in the deliberative phrase in which the weapons systems estimates are being considered, coming up through the Army structure, we frequently do look at a range. Sometimes that range is described between the bounds of the independent cost estimate on one hand, the project manager's estimate, perhaps even a third. When you get to the point of translating that range into a point estimate as you face the budget constraints, and as you face coming to the realities of what you will put in a budget, very frankly, if you have too many systems in range, you have no bounds to your budget. I don't know quite how you would make that transposition between the deliberative process and formulating a process document like that.

Chairman ROTH. Let me ask you this question, then, and I think there is a lot of merit to what you are saying. If we do have a ceiling, what about making that a cap so that if the costs go beyond that, it requires a review, both within the Pentagon at the highest level and possibly by the Congress as well? Do you see merit in that?

General MCCALL. Sir, I think we have, in the recently instituted unit cost caps in the various provisos for breach of certain thresholds, quite adequate things that cause red flags to go up, and you have to explain cost overruns.

Chairman ROTH. General Chubb.

General CHUBB. We have the threshold system that goes along with the DSARC's and additional thresholds in the service contract with OSD. When we exceed a program or cost threshold, there is a major review at the top level of the Department of Defense. We also have thresholds in the budget review process with Congress. When we don't stick to the plan we laid out with Congress, that is discussed in the appropriation and authorization hearings.

So thresholds may not be laid out the way you described it, but they do exist, both in the service contract with OSD and in the authorization and appropriations cycle.

Chairman ROTH. Just let me point out the GAO position. They say, "DOD Directives 5001 and 5002 do not establish firm not-to-exceed thresholds over the life of a weapon system's acquisition program, and do not require a decision on program continuation when a cost threshold is breached. Examples drawn from our seven weapons systems illustrate that the cost estimates presented at the milestone decision points are not effective cost restraints.

"On the Bradley, the estimate used for the production milestone decision, scheduled for January 1980, showed a total program cost of \$7.742 million. Eleven months later, the December 1980 SAR showed a total program cost of \$12,686.7 million." It does appear that if there is a cap, it is not a very effective one.

Let me ask you one more question, and then I will turn it over to Senator Pryor.

Senator PRYOR. I have no more questions, Mr. Chairman.

Chairman ROTH. Let me ask a question following Senator Pryor's line of questioning. What can we do? How can we stop this underestimating of costs on the part of contractors in order to get—

General CHUBB. On the part of contractors?

Chairman ROTH. Yes.

General CHUBB. As you would expect, I have a different view of that. My view is, nobody that has been in this business very long working in the field, in program offices or running programs, takes for granted anything a contractor hands to you; particularly cost proposals. In fact, in the case of the B-1B, when Rockwell gave us their cost estimate, we put together a team of about 150 people and worked 2 years to figure out what the cost should be, and that resulted in the \$20.5 billion baseline. The B-1 program has tracked very well to that baseline estimate.

The reason I want you to come to Systems Command is there is a lot more professionalism in our military program management approach than I think your staff may have told you. I think you need to see that.

Let me present a few more thoughts on how we handle contractor estimates.

The first thing the program manager does when he gets a contractor estimate is put together a team. The program manager understands technically what is in the estimate; he understands what the contractor's motivations are; and tries to get to the truth of the real cost. Not only that, the program manager deals in negotiations with the contractor to establish the right cost.

I think what you have to depend on is a good, strong, program management organization. I think you have that with the Air Force. We try to make sure that we don't accept either a low contractor bid where he may be buying in or a high contractor bid where he may be trying to charge the Government too much money.

I believe you have that good, strong program management in the current group of managers, at least the group of managers that you have in the Air Force. I think that is the way you keep program costs on track.

Chairman ROTH. Let me ask you this. How many program managers have you had, say, in the case of either the B-1 or the C-5?

General CHUBB. Let me answer on the B-1. I was the B-1 program manager for 4 years. General Martin was the program manager for 3½ years. General Thurman took over when I was reassigned, and he is serving in his third year. In the case of the C-5, I will have to provide the exact number or program managers for the record.

[The information follows:]

The C-5A, including the current program manager, has had 8 program managers since its start in 1963.

I know the GAO has indicated we had several program managers in a short period. If correct, that is not good.

But let me tell you the other side of that story and we have numerous cases. General Bellis ran the F-15 for almost 5 years and we kept people on the program for 4 and 5 years. You have asked how we compare with industry. Historically, industry is running on

the average about 3 years for their program managers on our major weapon systems. We average about 2½ years. That point is very important, but I think more important is program stability. As long as you have good managers and maintain program stability, the exact tenure becomes less important. With respect to the question you asked earlier about the quality of our managers, we take a second lieutenant and we put that officer right into acquisition school and teach him this business. We have a separate personnel control center for acquisition officers that monitors that officers performance. Those officers that demonstrate business sense, financial sense, contract sense, as well as being good engineers are moved up into tougher and tougher program management jobs.

In fact, we have 20 generals in Systems Command now who spent most—and by most, I mean 10 to 20 years of their careers as program managers and in the program management business. We set out to achieve this a long time ago, and I think that is a very good story. I need to get you over to Systems Command and show you that story, because we are very proud of it.

Chairman ROTH. The question is, most of your systems take what, 10, 15 years? How much longer will the B-1B take?

General CHUBB. The B-1B we will complete production in approximately 5 years. The present program director will carry it through the negotiation and award of all the production contracts; that is the plan, anyway. A lot of things can happen. A lot of people leave the service and other things can happen, but the plan is, he will carry that production system through this critical phase. There are other reasons you don't want to see a manager on a program for 15 years. The key is to put a talented person on the program. The minute you don't bring in a talented person, you are absolutely right. But a new and talented manager brings in new ideas, new vitalization, and that is what is good about our system.

If you look at industry, you will find places where they left the same manager on the job for too many years. The manager became too entranced in routine and didn't bring the required new ideas and visions to the job. Changing a manager after 3 years is not all bad if you do it at the right time. You don't want to do it when you are going into Full Scale Development [FSD] or into production. You want a manager to carry the program across those milestones.

Chairman ROTH. I want to get some more information on this, and I will send a letter to you.

General CHUBB. I would like to respond to it.¹

Senator PRYOR. I didn't have any questions until the general made those statements. What you are saying is that you have a good system.

General CHUBB. For training program managers from lieutenant to general.

Senator PRYOR. You say that you do not take the contractor's original bid for granted, in other words, you really go into that bid, and you said 150 personnel, I believe—

General CHUBB. On the B-1B.

Senator PRYOR [continuing]. For the bid on the B-1B. Why do we have so many cost overruns?

¹ See p. 107 for responses to written questions submitted by Senator Roth.

General CHUBB. The basic reason is lack of program stability. We don't stick to the planned program.

Senator PRYOR. What does that mean now? I'm a layman. What does that mean?

General CHUBB. Program stability comes down to one thing. You lay out and baseline a program. What we have tried to do in the last few years in Air Force Systems Command is lay out a baseline. Everybody decides up front what they want on that program. If you do that, then the cost estimator is estimating the right program. Then you have to stick with that program. If you change the production plan, if you stretch the program, if the budgets change, if what is required changes, then you lose that stability. But if you can maintain the stability, and if you can estimate the right program up front, you won't see any cost growth.

Now, that is not an easy challenge, but the way we are trying to overcome it is by baselining our programs so people decide up front what is required and how much it will cost.

Senator PRYOR. How much cost growth, now, for the record, have you seen in the B-1B program?

General CHUBB. Zero, absolutely zero. That \$20.5 billion budget that we worked 2 years to develop is absolutely right on the mark. In fact, that is probably the greatest success story in cost estimating that I have ever been associated with. That is estimating an airplane with over 300,000 parts. Usually you expect to be within 10 percent and you are proud of it. But the B-1B is tracking within budget, and it is assembled and going into final production testing.

I think the B-1B is a real success story on good cost estimating, and good cost baselining, the way we ought to do business.

Chairman ROTH. Does that figure include the actual procurement of the bomber itself?

General CHUBB. Yes, sir.

Senator PRYOR. Or the ultimate development leading up to procurement?

General CHUBB. Development and the bomber itself, sir.

Senator PRYOR. How many of the bombers?

General CHUBB. One hundred.

Senator PRYOR. And you don't anticipate that cost overruns?

General CHUBB. Absolutely not, as long as we all stick to the program that we baselined, and that program is a four per month production rate. If anybody changes from the four per month production rate, then what happens is obvious. You are carrying a large company for a greater length of time. When you are building something as complex as a B-1B, it will cost a lot of money to carry that work force another year or 2 years. That is why all the upfront study work helps—there are a lot of little things that can help, but the biggest thing is to stay with the original plan. That is what eats us alive, when we stretch way out the program.

I am not saying all reasons to stretch are bad but that is a different subject. From a cost estimating viewpoint, a cost estimator cannot properly estimate if we in the system continuously change the program. His estimate will be worthless. So we have to maintain stability.

Senator PRYOR. I was just going to ask one final question. You are basically saying the system in the Air Force does not need to be changed?

General CHUBB. Our system of management, sir. We all need to make changes. We all can make improvements, but our fundamental system of management is good. Our fundamental system that we adopted 2 years ago to baseline programs, and estimate the right program up front is a move in the right direction.

I am not going to tell you we don't make mistakes, because I can show you mistakes, but I think we have a good system.

Chairman ROTH. Yes?

General MCCALL. I just wanted to add one important variable in direct response to your question of how do you keep contractors from buying in, and that is, the careful selection of the right contractual instrument that you put on the street, there is a whole litany of cost-based and price-based contracts that will cause contractors to make different decisions as the cost estimates that they will put forward.

So you have to match that contractual instrument to the degree of complexity and the degree of technological risk, involvement, and different development. Sometimes the infamous cost-plus contract may be the best thing to do, but you have to assess that and put that on the street and that cost as a business matter to key into the degree of lists that they will incur, depending on their estimate.

Chairman ROTH. Let me just make a couple of comments, and then it is twelve, so we will bring this to a close. But before I go into that, I do want to point out that the GAO did compliment the Army that it was proceeding with the program to make an intense effort to improve its estimating practices. I congratulate you on that. They also observe, however, that you are having difficulty in getting cooperation at some of the lower levels. I would just like to, without getting into any major discussion on the B-1B today, point out for the record, that the GAO report stated:

The B-1B program office was told by the Secretary of Defense to exclude certain items, for example, the simulator from the B-1B program so that the President could certify that the program costs would not exceed \$20.5 billion. B-1B The Program office estimate excluded these items, but the independent Air Force estimate and OSD Cost Analysis Improvement Group estimates included them. The B-1B SAR does not include these items or their costs, but lists them as related programs.

What I am saying is that I think it is critically important that we have a standard, a guideline, which I would prefer be prepared and issued by the Secretary of Defense so that there is clarity as to what is included and what is not so that it doesn't include the kind of argument as to whether it was justified or not.

On the point of management, I would just like to quote from some testimony given on November 16, 1983, by someone who I think was one of the most able Under Secretaries that we have had in the Department of Defense, as well as one of the recognized industrial leaders, and that is David Packard. He said in testimony before the Senate Committee on Armed Services:

It seems to me that the only way the services can develop managers of the quality needed for these major programs is to make defense procurement a separate and a life time career for the people who do the work.

Officers would not rotate back and forth from military assignment to procurement assignment. A project manager would have a great deal of management training before he was assigned to a major weapon program and when assigned, he would be kept in charge of that program until it was completed.

I think if there was any way that the services could be restructured so that there was a career path for management people and those management people were selected with some background and expertise and interest in the management process, we would see a great improvement.

You talk about cost overrun; the way to control cost overrun is to put good managers in charge of their programs. If their program ends up with non-accepted cost overruns, they should be held accountable for it. If you do that for a while, you will have your managers responding to what they should be responsible for.

I'm not arguing today whether you have it in the Air Force or not, but I think it is very interesting that one of the leading industrialists who has a real wealth of experience and background says that the Pentagon, as a whole, does not have that. We do intend to continue to proceed with our proposal and investigate that.

Incidentally, he makes another point which is worthwhile bringing out, the second comment is to illuminate the amount of oversight. The amount of oversight is really a very serious problem. I expect there is really a lot of truth to it. I think that we built a bureaucracy, some of which we have here on the Hill, too, that perhaps did not add a lot to the overall control of these programs, and I think that is something we should be very much interested in.

Well, gentlemen, I want to thank you all for being here today. We shall be continuing these oversight hearings. I do intend to push ahead, to try to get some kind of a standardization on guidelines with enough specificity that they are helpful to us and at the same time don't build the inflexibility that you are concerned with.

Thank you very much.

General CHUBB. Thank you very much, Mr. Chairman.

[The prepared statements of Mr. Quetsch, General Chubb, General McCall, Mr. Pyatt, and responses to written questions follow:]

PREPARED STATEMENT OF JOHN R. QUETSCH

I am very happy to appear before the committee this morning to testify on the development and reporting of cost estimates for major weapon acquisitions and to update you on our initiatives to reduce the costs of weapon systems. Some of the following statements are repeated from our prior testimony because I believe it is important to communicate some of the things the Department is doing. I will discuss the reports we send to the Congress to include the selected acquisition reports, the unit cost reports, the RDT&E descriptive summaries, and the congressional data sheets. I will then discuss the types of cost estimates and the different techniques we use in estimating, the role of the Cost Analysis Improvement Group, and the planning, programming, and budgeting system. I will discuss our weapon systems cost growth and the progress we have made in the last two to three years. Finally, I will close with a discussion of how we are using the acquisition improvement program to control costs.

REPORTS TO CONGRESS FOR MAJOR WEAPON ACQUISITIONS

Effective management requires periodic reporting on program status so we can compare actual performance with our estimates and make adjustments as necessary. One measure of our long term performance in planning and controlling our major acquisition programs is provided by the cost histories reflected in selected acquisition reports which we provide to the Congress. We now have an additional requirement to provide the Congress with unit cost exception reports which are closely related to the selected acquisition reports (SARs). In addition to these reports, we provide a significant amount of cost information in other reports such as the research, development, test, and evaluation summaries and congressional data sheets in connection with the justification of the defense budget. Let me describe these reports before discussing cost estimating.

SELECTED ACQUISITION REPORTS (SARs)

The selected acquisition report, or SAR, instituted by DoD in 1967 is a standard, comprehensive, summary status report on major defense acquisition programs. The SAR: (a) reflects the current best estimate of key performance,

schedule, and cost goals, (b) compares these estimates with baseline parameters; and (c) explains all performance, schedule, and cost variances from the baseline.

The SAR is not a decision document, but is like a snapshot taken at the end of each quarter reflecting the overall status of the weapon system program. The SAR reports the progress and the problems in meeting performance, schedule, and cost targets of the program. The SAR focuses primarily on exceptions to the approved baseline plan and to breaches of program thresholds that were approved at milestones I, II, or III. It provides a means of comparing actual with planned accomplishments.

In February 1969, Senator Stennis, chairman of the Senate Armed Services Committee (SASC) asked the Secretary of Defense to provide him with a periodic status report on major weapon systems. The Secretary decided in April 1969 to use the SAR as the vehicle to satisfy the SASC requirements. Over 150 weapon systems, valued in excess of \$800 billion, have been reported in SARs. In 1975, *Public Law 94-106*, the FY 1976 and FY 1977 appropriations bill, established the SAR as the legal reporting document to the Congress. This law was amended by *Public Law 96-107* at the request of the DoD. The purpose of this revision was to tie the December SAR to the submission of the President's budget. *Public Law 97-252* further amended SAR legislation to expand the number of programs covered by SARs, to commence reporting earlier in the acquisition cycle, and to make unit cost reporting a permanent requirement. This recent legislation has doubled the number of defense programs in the selected acquisition reporting system, while it placed reporting for the second, third, and fourth quarters of a fiscal year on an exception basis.

The program acquisition cost section summarizes all changes to both costs and quantities which have occurred in the program since the establishment of the baseline. The program costs are shown for development, procurement, and construction in the program base year dollars as well as in current dollars. I will define these terms later. Also shown is the amount of economic escalation included in the program at the time the baseline was established. In addition, all cost changes to the baseline are reflected in both constant and current dollars. The current estimate reflects total acquisition cost of the *latest approved program* which includes

a provision for experienced and projected escalation. All cost variances are summarized by category. These categories are:

- (1) Economic escalation - impact of economy on base program;
- (2) Quantity change - change in quantity to be procured;
- (3) Engineering change - alteration of the physical or functional characteristics;
- (4) Support change - change in spare parts, training, and ancillary equipment;
- (5) Schedule change - change in procurement or delivery schedule or intermediate milestone;
- (6) Estimating change - correction or refinement of original estimate;
- (7) Other change - changes not included in the other categories.

DoD policy requires costs to be reported consistently in the SARs. SAR policy, however, permits the exclusion of costs when they are determined to be no longer unique to, or otherwise appropriately chargeable to, the system. For example, the costs of the 25mm ammunition procurement program were recently deleted from the Bradley Fighting Vehicle Systems SAR, because the ammunition will be used on all 25mm weapons, including the Bradley System.

UNIT COST EXCEPTION REPORTS

The Congress, in an effort to focus more management attention to the area of cost growth, instituted the "Unit Cost Exception Report" (*Public Law 97-86*, section 917 of DoD Authorization Act, 1982). This requirement became permanent legislation with *Public Law 97-252* that amended *section 139, title 10, United States Code*. This legislation requires the DoD to submit unit cost reports whenever certain thresholds are breached and covers all programs on the selected acquisition reporting system. A report is required when a Secretary of a Military Department has reasonable cause to believe that there is an increase of 15 percent or more in the program acquisition unit cost (PAUC) or in the current procurement unit cost (CPUC) in one or more of the current 86 SAR programs. The Secretary of a Military Department must promptly notify Congress and follow up within 30 days with a

report that: (a) states the reasons for such increase in the total program acquisition unit cost or current procurement unit cost, (b) identifies the military and civilian officers responsible for program management and cost control of the major defense system, (c) states the action taken and proposed to be taken to control future cost growth of such system, (d) reports any changes made in the performance or schedule milestones of such system and the degree to which such changes have contributed to the increase in total program acquisition unit cost or current procurement unit cost, and (e) identifies the principal contractors for the major defense system and the contract performance assessment information with respect to each major contract.

If the increase is more than 25 percent, the Secretary of Defense must certify within 60 days that: (a) such system is essential to the national security, (b) there are no alternatives to such a system which will provide equal or greater military capability at less cost, (c) the new estimates of the total program acquisition unit cost or current procurement unit cost are reasonable, and (d) the management structure for such major defense system is adequate to management and control total program acquisition unit cost and current procurement unit cost.

The law requires program managers to submit quarterly unit cost reports to the Secretary of the Military Departments on all SAR programs. These reports include current estimates of the program acquisition unit cost, the current procurement unit cost, changes in schedule and performance specifications, and cost or schedule variances in a major contracts under the program.

The Department has been under this statutory provision since October 1, 1981.

RESEARCH, DEVELOPMENT, TEST, AND EVALUATION (RDT&E) DESCRIPTIVE SUMMARIES

The RDT&E descriptive summary contains data for each R&D program included in the budget request to Congress. This exhibit provides both financial tables and narrative description of the planned effort for the entire life of the program. The exhibit includes the following information: (a) the mission need being satisfied by the effort funded in a specific line item, (b) the prior year program

accomplishments, (c) the budget year planned effort, (d) the program plan for future years, (e) program milestones covering the development and production phases, (f) program characteristics and objectives, (g) major contractors and government activities involved in the program, (h) funding tables indicating all past year funding, budget year, and budget year plus one detailed cost estimates, and a summary of the outyear funding estimate. For the FY 1985 budget, the Department submitted about 830 RDT&E descriptive summaries.

CONGRESSIONAL DATA SHEETS

A congressional data sheet is a comprehensive document submitted to the Congress annually with the budget for weapon system acquisitions funded from the procurement appropriations. For the FY 1985 budget submission, congressional data sheets were prepared for 160 programs. The congressional data sheet contains the following information: (a) narrative description, mission statement, current program acquisition cost estimates, and the basis for the current budget request, (b) contract data indicating type of contract, names of contractors, and contract award dates for prime contracts and major subcontractors, (c) explanation of acquisition cost changes by appropriation since the preceding budget submission, and (d) test and evaluation data.

By including an explanation of cost changes by appropriation from one year to the next, the Congress is able to see the program cost changes since the program was last reviewed. At the same time, the change in program costs from inception is available to the Congress by comparing these documents over several years. The congressional data sheets represent an important element of the information provided to the Congress on major DoD acquisitions.

Collectively, the SAR, the RDT&E descriptive summaries, and the congressional data sheets provide the Congress cost information on all major DoD acquisitions.

DEVELOPING COST ESTIMATES FOR MAJOR WEAPON SYSTEM ACQUISITIONS

Cost estimates for major weapon system acquisitions are developed in support of two management processes in the Department of Defense: (a) the Defense System Acquisition Review Council (DSARC) process, and (b) the planning, programming, and budgeting system (PPBS).

Under the DSARC process a major system new start program is endorsed by the Secretary of Defense in the context of the Military Department's budget. At milestone I, the Secretary of Defense decides whether to commit resources for advanced development. The cost estimate developed at milestone I is called the *planning estimate*. At this point, the DoD has not yet closed any of its options for acquiring a specific system, so planning estimates reflect characteristics and costs of a generic system. Since this milestone marks the completion of an exploratory phase, program specifications, cost, and quantities are preliminary and will be more fully developed before selecting one or more alternatives for the demonstration and validation phase. This is in consonance with OMB Circular A-109, which states that care should be exercised during the initial steps of the acquisition process not to conform mission needs or program objectives to any known systems or products that might foreclose consideration of alternatives. Since the planning estimate is not associated with a well-defined weapon system, its use is only relevant to aid in the decision process of selecting a concept from a number of alternatives. The planning estimate should not be used as a baseline estimate from which cost performance is measured.

Parametric estimating techniques are frequently employed at this initial phase; these parametric estimates are based upon data obtained during the development, production, and fielding of similar predecessor systems. Parametric cost models relate cost to system performance or physical characteristics, for example, weight, speed, or range. They are useful at this stage because only general characteristics of the system are known. A detailed cost estimate based on engineering techniques cannot be developed due to lack of specific design criteria.

At milestone II, the Secretary of Defense decides on whether to commit resources to the full-scale engineering development (i.e., detailed design) of a major system. The estimate of operational/technical characteristics, schedule, and program acquisition cost, developed at the time the Secretary approved full-scale engineering development, is called the *development estimate*. This is the baseline from which we believe that program performance should be measured.

The milestone II decision point focuses on specific system alternatives being recommended for full-scale engineering development. Specific system characteristics and the required quantities needed to meet the projected threat are decided at this time. However, considerable uncertainty may remain at this point, for example, uncertainties in the projected threat and technical and business uncertainties to be addressed by the full-scale engineering development program. At this point, a cost estimate for full-scale engineering development usually based on an industrial engineering or *grass roots* estimating approach is available from contractor proposals. The pure industrial engineering approach relies on detailed simulation of all operations and an exhaustive list of all the materials required to develop and produce a unique and specifically defined piece of equipment. This procedure also makes use of standards built up from time and motion studies, vendor quotes, manloading requirements by work center and stations, and learning curves. Parametric cost estimate or cost estimates based on analogous systems are used by DoD cost estimators to provide a check for realism.

The milestone III decision point in the acquisition process focuses on the decision to proceed to production of the weapon system. At this time, detailed engineering cost estimates are available from contractor proposals. Estimates can now be made on the basis of actual cost experienced during advanced development, full-scale engineering development, and low rate initial production. This information is coupled with historical data on similar systems for projections of cost improvements realized during production. The estimate of operational/technical characteristics, schedule, and program acquisition cost, developed at the time the Secretary approves production, is called the *production estimate*.

Cost estimates on acquisition programs are developed independently by DoD and then transformed into budgetary requirements. These independent assessments

may require different estimating methods and different types of data to develop. Depending on the circumstances, cost analysis can draw from many sources of information to develop independent estimates. These sources include data obtained from contractor accounting systems and are required for program management, for cost analysis and for stating funding requirements. These data are reported in accordance with DoD policy and are used as an input in developing DoD estimates.

COST ANALYSIS IMPROVEMENT GROUP (CAIG)

The CAIG serves as the Secretary of Defense's independent cost estimating organization. Its assessments are made independently from each of the Military Departments.

OSD requires that the Military Departments submit not only the project manager's estimate at each of these milestone decision points, but also a second estimate prepared by an organization independent of the program office. Prior to the convening of each DSARC, the Military Department presents these estimates to the Cost Analysis Improvement Group, or the CAIG.

The CAIG, established by OSD in 1972, advises the chairman of the DSARC on all matters related to cost. The CAIG is made up of representatives from the Under Secretary of Defense, Research and Engineering, the Assistant Secretaries of Defense -- Comptroller; Manpower, Reserve Affairs, and Logistics; and the Director, Program Analysis and Evaluation. Also, represented are the Military Departments and the Joint Chiefs of Staff (JCS). On the basis of the Military Department's presentation and its subsequent analysis, the CAIG provides to the DSARC its evaluation of both program manager's and the independent estimate.

At the meeting of the DSARC principals, the program manager's estimate and the results of the CAIG review are presented and significant variances among these estimates are explained. Members of the DSARC are then able to make an informed judgment on which cost estimate, or range of estimates, for a given system is the most valid figure on which to base their decision.

Inherent in this process is the development of a range of cost estimates which reflects the potential for program cost growth. This tests the willingness of the DSARC to proceed with the acquisition of the system despite the risk of this potential growth, as opposed to other alternatives. In addition, the presentation of independent estimates at DSARC reviews and the requirement to explain significant variances among these estimates encourages the program manager to provide more realistic cost estimates.

In addition to support of the DSARC process, the CAIG provides cost reviews of selected weapon systems as part of our PPBS process, supports the review of the unit cost exception reports, and responds to requests from the Secretary or other principals of the Department. I will discuss the CAIG's role in the PPBS later.

Congress has been very interested in independent cost estimating and believes that it is so important that the Defense Authorization Act for FY 1984 amended *section 139, title 10, United States Code*. This amendment legislated the requirement for independent cost estimating on all major defense acquisition programs. The Secretary of Defense may not approve the full-scale engineering development or the production and deployment of a major defense acquisition program unless an independent estimate of the cost of the program first has been submitted to and considered by the Secretary of Defense.

PLANNING, PROGRAMMING, AND BUDGETING SYSTEM

The management process by which DoD develops a five-year plan and which culminates in the presentation of the President's defense budget to the Congress each year, the planning, programming, and budgeting system (PPBS), is closely associated to the DSARC process and the development of weapon system cost estimates. After receiving fiscal guidance as a result of the planning process, the Military Departments develop program objective memorandums (POMs) during the programming phase. This process involves definition and analysis of alternative forces, weapon systems, and support systems together with their resource implications. During the POM preparation, the Military Departments update their weapon system cost estimates on the basis of new information received during the

past year. Depending upon the stage of development, i.e., whether the weapon system is being justified as a new start or is at milestone I, II, or III in the acquisition process, the cost estimate will be based on one or more of the following techniques: parametric estimate or an estimate based on an analogous system, an estimate based on actual cost projections, or a very detailed industrial engineering estimate based on contractor proposals. One of the acquisition improvement program initiatives implemented in the Department at the start of this Administration was to improve the linkage between the DSARC and PPBS processes.

During budget development, the Military Departments translate programs from mission description to appropriation categories as required by the Congress. The Military Departments again, at this time, review and validate weapon system cost estimates which are approved in program budget decisions (PBDs). As the budget is developed, budget back-up and justification materials, such as the congressional data sheets and the RTD&E descriptive summaries, are also prepared for congressional review.

COST GROWTH IN WEAPON SYSTEMS

It is important at this point to provide some basic cost definitions. The terms *base year or constant dollar* and *then year or current dollars* are used extensively and are often confused. The distinction between these terms is not significant in most day-to-day off-the-shelf purchases. But the difference is critical in programs which require many years to develop and produce -- especially during the periods of high inflation. In this regard I would like to note that some of the procurements, which we reported in the selected acquisition reports in March extend into the 1990s.

Current dollars are dollars spent in the year in which the cost is incurred, that is, when the work is done. DoD appropriations are stated in current year dollars, the amount reflecting the actual dollars paid out. When future costs are stated in current dollars, the amount given reflects the expectation of actual dollars which will be paid out, including any amount projected to account for future price changes.

On the other hand, *base year* dollars are fixed in value for the year in which the estimate is made, for example, FY 1975 constant dollars. An estimate is said to be in base year dollars if costs for all work contemplated in each year of a multiyear program ignore future inflation and reflect the average level of prices prevailing in the base year.

These terms are important to keep in mind to separate and describe the sources of cost growth. For example, cost comparisons made in base year dollars reflect changes in a program that would be present without the effects of inflation. Cost comparisons made in current dollars include the effects of inflation. In periods of high inflation, the difference can be significant.

Table 1 shows the cost history of the F-15 as an example. In 1970, at the time the development estimate was developed, we estimated that this program of 749 aircraft would cost \$6.0 billion in terms of FY 1970 base year dollars. A prediction for the effects of inflation throughout the planned life of the program amounted to \$1.4 billion. This gave an estimate of \$7.4 billion in current year dollars. Since the baseline was established, the projected total buy has been increased by 627 aircraft. The base year impact of this quantity change in FY 1970 constant dollars is a \$3.6 billion increase to the program. If inflation is included, the increase is \$16.5 billion. Other changes, such as engineering, schedule, estimating, and support have resulted in an increase of \$3.3 billion in base year 1970 dollars, or \$11.8 billion in current dollars. In addition to these changes, unexpected changes in the price level index since the baseline was established have added another \$2.5 billion in inflation.

Ignoring the effects of inflation by measuring the constant FY 1970 dollars, the cost growth in this program from 1970 to 1983, after adjusting for the increased number of aircraft, is \$3.3 billion, or 35 percent. Measured in current dollars, the presence of uncertainties in estimating inflation produce a different result. After adjusting for the increased number of aircraft, the cost growth in current year dollars from 1970 to 1984 was \$11.8 billion, or 60 percent.

Cost History of F-15 as of March 31, 1984

(Dollars in Billions)

DOLLAR MEASURE	DEV EST	DEV EST ADJ FOR QTY CHANGES	PROG CHANGES	UNANT ECON CHANGES	CURRENT EST	% CHG ADJ FOR QTY
Base Yr	\$6.0	\$9.6	\$3.3	—	\$12.9	35%
Current Yr	\$7.4	\$23.9	\$11.8	\$2.4	\$38.1	60%

TABLE 1

This single example of the F-15 illustrates the dramatic difference between base year and current dollar estimates in a period of high underlying inflation. To give a complete view of DoD cost estimation and control, both base year and current cost measures should be used. DoD baseline estimates are generated in base year dollars and then adjusted to account for projected inflation. The emphasis on realistic base year cost estimates is evident in the DoD process for developing and approving estimates for weapon programs.

Table 2 summarizes SAR data as of March 31, 1984. The data encompasses 86 major programs and are part of the President's budget submitted earlier this year. All of this information is summarized in the SAR summary tables which we provide to the Congress along with the SAR for each program.

**SAR Program Cost Summary of 86 Major Programs
As Reflected in the March 31, 1984 Reports**

(Dollars in Billions)

DOLLAR MEASURE	BASILINE EST	BASILINE EST ADJ FOR QTY CHANGES	PROG CHANGES	UNANT ECON CHANGES	CURRENT EST	% CHG ADJ FOR QTY
Base Year	\$311.6	\$351.3	\$41.4	--	\$392.7	12%
Current Year	\$470.1	\$593.7	\$128.8	\$26.1	\$748.6	26%

TABLE 2

The table shows, in base year and in current dollars, the sum of the baseline estimates, these same estimates adjusted for changes in quantity, total cost due to program changes and changes in economic escalation, the current estimate, and the percent change since the baseline estimate was made. Removing the effects of inflation and measuring in base year dollars which have been adjusted for quantity, total real cost growth for the 86 systems from the time of the baseline estimate to 1984 is 12 percent. In current dollar terms (including cost growth due to inflation), the cost growth has been 26%.

AVERAGE ANNUAL RATE OF COST GROWTH

Our examination of historical selected acquisition reports indicates that DoD has made, after adjustment for quantity changes and escalation, substantial improvements in controlling cost growth in recent years. Figure 1 shows the annual rate of growth of selected SAR systems from 1978 through 1983. In base year dollars, the annual rate of growth has dropped from a high of about 8% in 1981 to a low of less than 1% in 1983. In current dollars, the annual rate of growth has dropped from a high of about 14% in 1980 to a low of about 1% in 1983. These growth rates are a useful guide to determine the general success of cost control in DoD. The



composite annual growth rate calculated each year is made up of the growth rates of many programs, each at different stages of development. The year-to-year variations in the composite annual growth rate may reflect the changing mix of programs as well as year-to-year variations in program specific growth rate. Figure 2 shows the growth in terms of current and base year dollars. These curves take the approximate shape of the curves in figure 1. In base year dollars, the annual growth has dropped from a high of about \$10.5 billion in 1981 to a low of about \$2 billion in 1983. In current dollars, the annual growth has dropped from a high of \$37 billion in 1981 to a low of about \$5 billion in 1983.

Another indicator on our progress towards improving our acquisition program is the number of unit cost breaches the Department has had since the unit cost provisions were enacted. We experienced 24 breaches during 1982, nine in 1983, and only two so far in 1984.

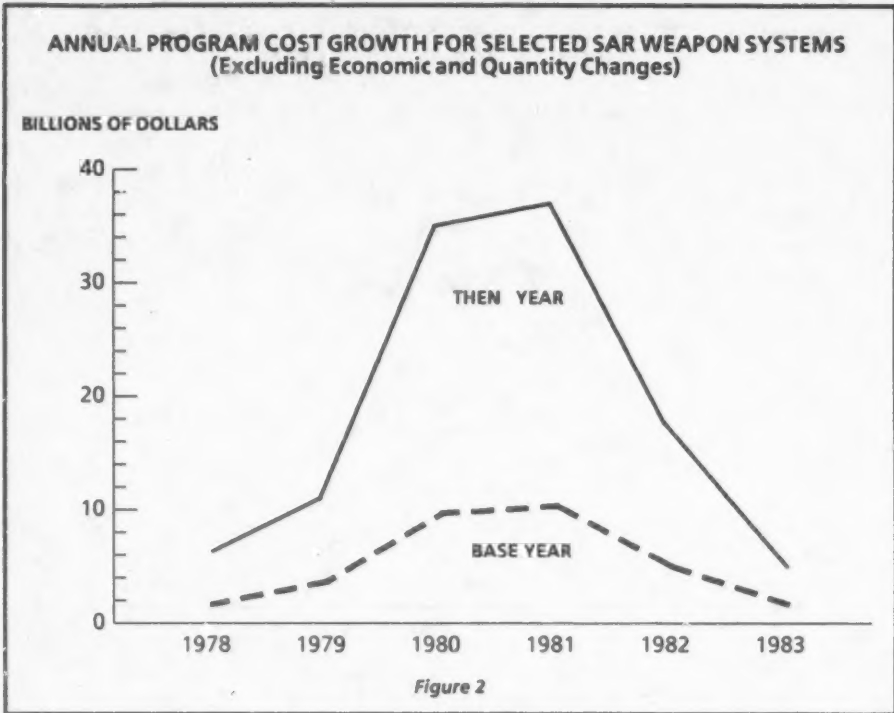


Table 3 shows a track of cost growth percentages in the SARs since 1975. This table shows the distribution of cost charges that occurred during the period from September 30 to December 31 for each year indicated. In reviewing total cost growth experienced, unanticipated inflation was the single major factor contributing to cost growth in major weapon system acquisitions during the late seventies and early eighties. During the 1975-1982 time period, unanticipated inflation varied between 57 percent and 85.5 percent of the total cost growth. With the success of the Administration's anti-inflation program, unanticipated inflation represented a smaller portion of the overall cost growth in the past year.

**PERCENT SAR COST GROWTH BY CATEGORY
FOR THE PERIOD SEP through DEC**

CATEGORY	75	76	77	78	79	80	81	82	83
Escalation 1/	65.6	57.0	78.6	67.6	85.5	72.2	77.7	81.0	14.2
Quantity	13.2	29.0	11.7	19.0	2.5	8.0	14.2	27.5	62.7
All Other 2/	21.2	14.0	9.7	13.4	12.0	19.8	8.1	-8.5	23.1
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

TABLE 3

- 1/ Includes changes in inflation rates and inflation associated with program changes.
- 2/ Includes the following categories: engineering, support, schedule, estimating, and other.

**CONTROLLING COST GROWTH AND THE ACQUISITION
IMPROVEMENT PROGRAM**

Cost growth in major acquisition programs has been the target of considerable congressional and DoD attention for many years. There have been numerous suggestions from both the private sector and various government agencies as how best to eliminate the increases experienced in the real cost of DoD weapon systems over their baseline cost estimates.

Three years ago we initiated the Defense Acquisition Improvement Program (DAIP) as a concentrated, high level effort to solve a number of longstanding problems in the acquisition process including controlling cost growth in major systems acquisition. The original 32 initiatives introduced by Frank Carlucci have provided an integrated means to accelerate and stabilize the acquisition process thereby contributing in an overall way toward the achievement of significant cost savings and reductions. It can be said that each of these initiatives, therefore, contribute either directly or indirectly toward controlling costs.

Nevertheless, there are certain initiatives which more than others, are intended to control cost growth. Many of these initiatives have been fully implemented and are integrated into the acquisition process. Thirteen of the original 32 initiatives have been fully implemented, four of which are directly related to improving cost control management. We have taken steps to insure the use of appropriate contract types (Initiative 8), and to reduce administrative costs through reduced reporting requirements and simplified contract procedures (Initiative 10). The Department now insures more accurate budgeting for inflation (Initiative 11), and the Military Departments fund their programs to cover technological risk. We are monitoring these initiatives on a periodic basis to ensure their continued implementation.

Other initiatives which concern cost control have not yet been fully integrated into the acquisition process, but efforts to achieve implementation are continuing. These initiatives were highlighted in the restructuring of the DAIP under Deputy Secretary Thayer. In June 1983, the Deputy Secretary determined that six areas of management required special attention. These included: (1) program stability, (2) multiyear procurement, (3) economic (stable) production rates, (4) realistic budgeting, (5) improved readiness and support, and (6) encouraging competition. Mr. Thayer established high-level working groups from OSD and the Military Departments for each of these six areas, and devoted his personal attention in seeking their implementation. Deputy Secretary Taft has affirmed this support for the six major management initiatives, and has recently introduced additional changes to the DAIP which I will describe in a few minutes.

Let me take a few moments first to outline the progress we have made in implementing the major initiatives which are of direct concern to us here today:

1. Program Stability. Everyone agrees that greater program stability will lead to lower long-term program costs. It should also be evident that this initiative is particularly difficult to implement since so many variables affect program stability, many of which are beyond the direct control of the Department. Changes in the threat or in levels of technology, for example, can contribute to program instability. Indeed, it is appropriate that we tolerate instability generated from such sources.

Other sources of instability, however, are more arbitrary, and are the ones we are attempting to deal with under this initiative.

We have been trying, for example, to improve the overall affordability of our programs by controlling the number of claimants for our limited resources. We have gradually reduced the number of the new major programs which have been approved while increasing the number of programs which have been cancelled or reduced. The number of approved new start programs has been reduced during the past three years from 15 to 10 to 4. At the same time, a total of 120 lower priority programs were cancelled or reduced during FY 1983 and FY 1984 budget. We estimate total savings from cancellations and reductions of approximately \$18.7 billion during FY 1981-1989.

2. Multiyear Procurement. The multiyear initiative reflects the greater stability we have achieved in some of our programs, and helps to ensure its continuation. Multiyear also means significant cost savings over annual contracting. We estimate that for the 23 approved multiyear programs, we will save about \$3.4 billion over annual contracting methods. We have included 12 multiyear candidates with estimated savings of \$1.1 billion in the FY 1985 budget.

There are still some skeptics, however, who think that multiyear is not advisable despite the evidence to the contrary. Last year, for example, Congress approved only seven out of 16 multiyear candidates. In addition, the FY 1983 and FY 1984 Appropriations Acts contain restrictive language on the initiation and use of multiyear. It appears that our colleagues in the House have begun to turn around on this issue, and I applaud their recent show of support for multiyear candidates in this year's budget. I am hopeful that members of the Senate will also begin to see the benefits of multiyear procurement.

3. Economic Production Rates. We made early progress on reducing the unit costs for some of our programs through more economical production rates. Budgetary reductions below our projected requirements, however, have meant that further progress in implementing this initiative has been limited.

Nevertheless, the savings from this initiative are still significant. The FY 1985 budget contains 19 economic rate programs which are estimated to save about \$2.6 billion during FY 1982-1989. In overall terms, we estimate that 76 percent of the major programs reviewed by the Economic Production Rate High-Level Working Group will achieve economic production rates during the current five year defense plan.

We are monitoring this initiative carefully during the program budget review to ensure that we hold the line on programs for which we have achieved more economic production rates. To the degree that funding becomes available we will pursue more economic production rates for additional programs.

4. **Realistic Budgeting.** No one questions that, in the past, the Department's planning figures for future costs were often optimistic. Despite the efforts to address this problem in the earlier years, it continued to plague the Department in the late 1970's -- a period of relatively austere defense budgets. It is the future implication of this historical record that is contentious. Charges have been made that the future cost record of the Department will be as sad as that of the recent past. These charges ignore the vigorous steps that this Administration has taken to deal with these problems on a systematic and decisive basis. We believe the FY 1985 and future budgets to be properly priced because of the significant efforts to control costs within the Department. Independent cost estimates prepared for Military Department-level decisions have been important in implementing this initiative.

The Air Force, for example, added \$100 million to its HH-60D helicopter program over the FY 1895-89 FYDP based on the findings of an independent cost study it conducted. That study indicated that the program manager's initial estimate was too low, given the technological risk associated with some of the advanced subsystems the helicopter will incorporate

The Army has also relied heavily on independent cost estimates in its acquisition decisions. The results of a cost study it conducted on the 155mm Howitzer Improvement Program, for example, led the program manager to add \$300 million to his life-cycle program cost estimate before submitting it to the Army

System Acquisition Review Council. The study had revealed that the program manager's estimate had understated the manpower costs associated with operating and maintaining the weapon.

A Navy example shows another way in which independent cost estimates can be used to produce better statements of budget requirements. Based on a review of the Advanced Lightweight Torpedo (MK-50) program by the Navy's independent cost analysis group, the program manager restructured his modeling methodology to incorporate historical data and industry performance averages of production experience. This permitted a better representation of the likely effects of competition on the program.

Since 1982, we have identified a number of systems each year for which we require the Military Departments to submit independent cost estimates with their POMs. Furthermore, we have directed that the Military Department Secretaries ensure that they have considered both the programs manager's estimates and the independent estimates in deciding on the five year funding levels to recommend for those programs in their POMs. Under this requirement, independent cost estimates were prepared for 10 systems in 1982 and 24 in 1983. That number will increase to 27 in 1984. Although in a limited number of cases independent estimates prepared in support of the POM process may also be used for a scheduled DSARC review, in most instances the POM-related estimates apply to systems that are not scheduled to undergo DSARC milestone reviews during the year in which the estimates are prepared.

To evaluate the impact of the independent cost analyses prepared by the Military Departments during development of their FY 1985-1989 POM submissions, we reviewed the major adjustments the Military Departments made to reconcile program manager's cost estimates with the independent cost estimates they commissioned. Of the 22 systems for which such reviews were completed, we found that significant additions of dollars or reductions of quantities were made on eight to produce more realistic funding estimates. Over the five year program period, these actions resulted in changes amounting to nearly \$1.5 billion in the budgets for these systems.

I should mention that the Defense Council on Integrity and Management Improvement (DCIMI) recently reviewed the Baseline/Cost Cap program initiated by the Air Force, and has directed the other Military Departments to test its application on a few of their systems. The Baseline/Cost Cap Program has high potential for improving cost growth control. In a nutshell, the program sets a comprehensive program baseline for major programs which is approved in writing by the appropriate three and four star commanders. Any change to the program baseline must be approved by all of the signatories to the baseline. A cost cap is established for the agreed upon program baseline, and can be adjusted only by similar unanimous consent. I think this concept holds great promise for providing greater stability and realism to our program budget process. I am hopeful that it proves appropriate for usage by the Army and the Navy.

5. Improved Support and Readiness. Long-term costs of a system are affected by the degree to which we consider the need for support logistics early in a program. We are doing a good job of laying the groundwork in this area. For example, we have set readiness goals for programs in the acquisition process, and are monitoring our progress at each major milestone review. We have made support requirements and funding more visible in the program budget review so we can see whether our requirements are receiving sufficient funding. Last year we tracked support funding for 23 major programs; all were fully funded for support. We'll be tracking more programs during this year's program budget review. I am confident that through such initiatives we will see fewer surprises in long-term support costs in the future.

6. Encouraging Competition. I won't go into great detail here, but I must reaffirm the Department's commitment to reducing the costs of acquisition through greater use of competition. We have set competition goals in the Services and the Defense Logistics Agency to provide incentives for improved performance. We have designated *Competition Advocates* at all of the major buying commands. We are placing greater emphasis on early planning for competition in development and production phases of programs as appropriate. We are looking hard at opportunities for second sourcing either at the prime or the subcontractor levels. And, of course,

we have made major progress in expanding the use of competition in the procurement of spare parts.

As you can see, we are continuing to pursue implementation of each of these major initiatives of the Defense Acquisition Improvement Program. We have made some important progress, but success cannot be achieved overnight. Nevertheless, we have already achieved important cost savings and reductions and have set the stage for more significant economic benefits in the future.

Deputy Secretary Taft strongly supports the DAIP and has taken a strong personal interest in continuing to monitor its implementation. Mr. Taft recently chaired two meetings of the DCIMI which conducted a comprehensive third annual review of the program. In addition to endorsing the Baseline/Cost Cap Program which I mentioned a few moments ago, the DCIMI, among other actions, approved the establishment of an additional priority management initiative to improve our nation's industrial responsiveness. A high-level working group is currently being formed and will establish a charter during the coming weeks. As a result of the new Industrial Base Initiative, there are now seven priority management initiatives contained in the DAIP. High-level working groups will continue to meet on each of these initiatives to measure our progress and outline additional actions needed for full implementation.

As you see Mr. Chairman, the Department has a comprehensive reporting system, both from the budget perspective as well as from the program status perspective. Our management initiatives to control cost have payed dividends as is evident by the declining rate of cost growth on our major weapon systems in the last two years. With the continuing success of the Administration's anti-inflation program, with the continuing implementation of our acquisition improvement program and with the continuing support from the Congress, we will continue to improve our performance.

Mr. Chairman, this concludes my prepared remarks. Thank you for the opportunity to testify today.

RESPONSES OF MR. QUETSCH TO WRITTEN QUESTIONS SUBMITTED BY SENATOR ROTH

Question 1. Has a program manager ever received a reprimand or other punishment on preparing poorly documented or inadequately justified cost estimates like those cited in the GAO report? Please be specific.

Answer. While cost problems, in a broad sense, have been a factor in adverse actions against program managers, there probably has not been a case of such actions being based solely on poor documentation or justification of a cost estimate. Documentation and supporting justification of any program cost estimate depends on many individuals besides the program manager. First, the system to be developed must be fully described to include the technical and operational descriptions of all necessary equipment. It would also include the manpower and installations required and the operational environment within which the system will operate. The program manager must depend on the users, the logisticians, the system and operational testers, and the contractors involved to properly determine and document all these requirements. Secondly, the program manager depends on cost analysts to select the proper estimating methodology and economic assumptions, to develop the complete cost estimate of the program, and to document the methodology used and the results of the analysis. Thirdly, the program manager relies on OSD and Military Department cost analysis review groups to validate this estimate. Any changes made to the program estimate, as a result of the validation must be tracked and documented. Finally, as the program experiences structure and content changes, caused in many cases by factors outside of the program manager's control, again tracking and documentation is required. Punitive action solely against the program manager who must rely on the judgment and performance of so many people, both within and outside of his control, would not necessarily be appropriate.

Question 2. Do you disagree with the GAO's report "DoD Needs to Provide More Credible Weapon System Cost Estimates to the Congress" that "increases in total program costs have become the accepted pattern—no one is held accountable for them?" If not, why not?

Answer. The Defense Council on Integrity and Management Improvement (DCIMI) recently endorsed the Air Force's Baseline Program which requires the major participants of each program to coordinate requirements and to establish a baseline, changes from which must be approved at the three and four star-level. A cost cap is developed and proposed for each of the programs which are baselined, and once established can be changed only to reflect approved changes to the baseline program. The DCIMI has requested the Army and the Navy to test the applicability of the Baseline approach on several representative programs, and the results will be monitored by the Realistic Budgeting Working Group of the Defense Acquisition Improvement Program (DAIP). The basic intent which underlies this effort is to minimize unnecessary changes to our programs and to express the serious intent of the Department to make program cost estimates more meaningful.

Our very positive experience with the \$20.5 baseline established by the Secretary on the B-1B shows that cost estimates can be taken seriously when upper management emphasizes them. The B-1B is reviewed monthly by the Secretary himself and the program is meeting its cost goals.

This Administration has taken the steps to make realistic cost estimates part of the budgetary process. Since 1982, we have identified a number of systems each year for which we require the Military Departments to submit independent cost estimates with their Program Objective Memoranda (POMs). We have directed the Secretaries of the Military Departments to ensure that they have considered both the program managers' estimates and independent estimates in deciding on the five year funding levels to recommend for those programs in their POMs. Under this requirement, independent estimates were prepared for 10 systems in 1982, and 24 in 1983; that number will rise to 27 in 1984.

We have found that, as a result of these comprehensive reviews, the Military Departments' initial cost estimates are often revised before the POMs are submitted, and they evolve into sound, defensible statements of financial requirements based on the best analytical and professional judgments that can be applied. Since, for a large number of major systems, the budgets of the Military Departments are based on cost analyses prepared in support of their POM submissions, the independent cost estimate process has been an important factor in ensuring that the President's budget, submitted to the Congress each January, reflects the most realistic cost estimates possible.

Question 3. Aren't cost estimates supposed to be used as management tools to constrain cost and would you disagree with the GAO's finding in its report they are not used for this purpose?

Answer. Cost estimates, first and foremost, should be the best possible forecasts of what will be the total costs to develop, procure and operate military systems. They must be considered best approximations not only because of the uncertainties inherent in any program as it goes through the acquisition process but also because of factors such as national economic developments that are exogenous to but directly affect the costs of defense programs. This situation requires that we strive continuously to perfect our estimating tools but it also requires that we provide some flexibility for our acquisition management so we can accommodate the inevitable impacts of developments that will cause actual costs to vary from our estimates. The Congress has recognized this characteristic of the estimating process by providing authority and procedures for reprogramming funds from one system to another as events dictate this need.

Cost estimates usually evolve into some form of a constraint that is regularly employed in acquisition management. A cost estimate may be the basis of a budget that is a well known constraint. The DSARC uses cost estimates to determine cost thresholds that, if breached, require a review and assessment of the program involved.

Program cost estimates as contemplated by the GAO report normally are long range in nature—for a FYDP period, for the full acquisition of a weapon system or, in some cases, for a system life cycle. The longer the period covered by the estimate the greater the possibility that unforeseen developments will require adjustments in those estimates. Thus, cost estimates should not be considered fixed regardless of changes in the marketplace. Treating cost estimates as fixed would result in pressure to produce overly conservative estimates to ensure that the estimates covered all possible uncertainties in the acquisition process. This would severely limit the ability of the DoD to make most effective use of financial resources authorized by the Congress for the national defense mission.

In DoD, cost estimates are used as an important tool in the resource allocation process and reflect costs expected to be incurred over a long period of time. To use these estimates as firm constraints could destroy the efficiency of this process and would preclude effective management of many defense programs. Inherent in the formal DoD System Acquisition and Programming and Budgeting processes, as well as the Congressional authorization and appropriation processes, are the constraints to ensure that acquisition programs are implemented as effectively as possible consistent with national defense objectives.

Question 4. GAO looked at five systems estimated by DoD to cost approximately \$44 billion and using DoD's own data and independent cost estimates found the systems could actually cost over \$65 billion. Do you disagree with their analysis?

Answer. The GAO computed costs of \$65 billion versus the DoD's estimates of \$44 billion for five systems are principally the result of GAO assuming much higher quantities than DoD was projecting or the DoD cost analyst was using as the basis for the estimates. In addition, the \$21 billion difference is made up of both constant and current dollars—furthermore, the constant dollars are not all in the same year's dollars. This is contrary to DoD 5000.4 that requires presentation in both constant and current dollars, but not a mix of the two.

The details by the five programs the GAO analyzed are:

B-1B

GAO's use of \$26.7 billion as a CAIG estimate for the B-1B is inappropriate. The November 1, 1982 OSD CAIG report on B-1B, on which the GAO was extensively briefed, does not include an estimate of \$26.7 billion for program acquisition. The report consists of three sections. The first, which is the only amount the CAIG recommended be added to the Air Force baseline, includes provisions for a full cruise missile capability, the exclusion of multiyear contracting savings until actual contractor bids are in hand, and funds for simulators. The CAIG recommendation on cruise missile capability was adopted (1/3 of the total) resulting in the \$20.5 billion figure in FY81 constant dollars. The report also included a section identifying possible program expansions and their cost, and also a section on cost risks the program might encounter. The report specifically did not recommend funding for the latter be added to the program at that time. DepSecDef memorandum of November 2, 1981 specifically excluded scope expansion of the program without his personal approval. Nevertheless, GAO has added the sum of the costs identified in all three sections of the CAIG report to arrive at the \$26.7 billion. At that time, GAO auditors were explicitly told that was not meaningful. It is even less meaningful now.

LSD-41

The GAO quotes an \$11.1 billion figure for LSD-41 rather than the DoD's \$4.8 billion. Part of this difference is due to GAO assuming a 16 versus 12 ship buy based on uncertainty over the quantity of LSD-41s to be procured at the time. As a result of the May 1983 CNA study "DON Long Term Amphibious Lift-Mix Study," lift requirements have been solidified at 12 and the amphibious ship mix generally set and accepted throughout DoD.

Aside from the differences in the number of ships used in their comparison, the GAO used a life cycle cost figure compared to the DoD estimate for ship acquisition only. The comparison is further invalidated because the DoD figure is in current dollars while the GAO "restated" estimate shown is in FY 1981 base year constant dollars. All these factors lead to an "apples and oranges" comparison.

APACHE

Of the \$1.9 billion the GAO asserts is understated, the GAO states that \$926 million is due to the use of improperly low inflation rates. GAO based this figure on a November 4, 1981 Army memorandum comparing then current DRI and OASD(C) inflation projections.

These DRI rates were forecast while the U.S. economy was experiencing the worst inflation rates in decades. Economic conditions have changed since that time and current OSD inflation estimates are close to the latest private sector (i.e., DRI) inflation projections. The 1981 projected rates which the GAO report would have the DoD use are grossly overstated as a present day projection.

Also, it is important to note that in January 1982 DoD persuaded OMB to allow us to use inflation rates for major systems—aircraft, ships, tracked vehicles, and missiles—based on Bureau of Economic Analysis, Department of Commerce actual market based experience rather than the GNP deflator we had been forced to use in the past. We have used this new deflator ever since—including on APACHE—with far better results.

BRADLEY

GAO's estimate of an additional \$3.6 billion requirement for Bradley includes \$1.2 billion for ammunition. While 25mm ammunition was at one time included within the Bradley line item, it has been deleted and is now shown separately since this round is now scheduled to be used by the AV-8B and the LAV as well as the Bradley. All 25mm ammunition is procured by the Army for both Army and Marine Corps use. Only about 60% of the 25mm ammunition procurements are for Bradley use.

The \$982 million of the understated costs suggested by GAO are for PPI items deleted by the Army. This amount was deleted explicitly by the Army for low profile antennas, heading reference set, driver's thermal viewer, improved maintenance and diagnostic equipment, and NBC protection equipment; all considered to be unaffordable.

An additional \$256 million is for the war reserve spares now funded in the Army POM.

HELLFIRE

Of the \$3 billion the GAO claims HELLFIRE is underfunded, about \$1 billion is based on the assumption the Army will buy the fire and forget seeker. That seeker is not now in the Army program and has not been for several years.

The additional \$2 billion is based on a GAO assumption that the Army will buy 47,200 more missiles than the projected total of 42,300 in the Army's January 1983 FYDP. While there is some softness in the Army HELLFIRE quantity projections, (this figure is tied to the number of APACHEs to be built), GAO has no legitimate rationale for pricing out a missile program more than double the Army's projected program and referring to the increase in dollar amount so derived as the measure of the understated cost of the program. In fact, such a HELLFIRE requirement could only result from acquisition of many more APACHEs than we are presently planning.

Question 5. Is it true that Defense Department Instructions no longer require documentation that will allow estimates to be traceable as GAO states in its report? If Congress or the Office of the Secretary of Defense cannot track an estimate back to see how it was developed and what changes were made, how can we be assured of the validity of estimates?

Answer. The GAO statement is not correct. DoD Instruction 5000.2, "Major System Acquisition Procedures" does require a Resources Cost Track Summary to be submitted with a System Concept Paper or Decision Coordination Paper for each major milestone decision. Significant variations in the estimates must be explained. Also, at each CAIG meeting held just prior to a DSARC, a cost track in constant "base year" dollars between the program manager's preferred alternative cost estimate and the cost estimates approved at previous DSARCs with an explanation of major program changes is presented in accordance with DoD Directive 5000.4, "OSD Cost Analysis Improvement Group."

Question 6. GAO reviewed the cost estimating methodology used by DoD in making its weapons cost estimates. GAO states that DoD assumes that costs on a weapon will go down as it is produced, the so called learning curve. Isn't this assumption, that costs will *always* go down, rarely borne out in reality? Doesn't the routine use of this optimistic learning curve result in consistent underestimating? In this regard, are the methodologies used by the so called "independent" cost estimators much better than those used by the program offices?

Answer. The learning process is a phenomenon that prevails in many industries. Its existence has been verified by empirical data and controlled tests. Although there are several hypotheses on the exact manner in which the learning or cost reduction can occur, the basis of learning curve theory is that each time the total quantity of items produced doubles, the cost per item is reduced by a constant percentage of its previous cost.

Factors that account for the decline in unit cost as cumulative output increases are numerous. One of the most commonly mentioned is job familiarization by workmen from repetitive manufacturing operations. Since the concept applies to actuals as they are incurred in repetitive operations, it will not necessarily be evident in budgetary data. Budget estimates are aggregations of many types of cost; only a part of procurement costs would be subject to learning in the traditional sense. If the budget estimates are optimistic and are continually being adjusted, learning would not be apparent. Budget estimates also include non-recurring effort, particularly in the early years of a program; again learning on the recurring effort would be obscured. Learning curves of similar prior weapons systems are very effective for helping to develop cost estimates of new systems, but learning curves must be understood and used properly.

Independent cost estimators use learning curves extensively to develop statistical relationships to provide more realistic program estimates. Differences in methodologies do exist between program offices and independent cost estimators. It is our view that there is no one methodology better than another. We encourage the use of several cost estimating methods to form a basis for confirming comparison and development of a realistic estimate.

PREPARED STATEMENT OF MAJ. GEN. MELVIN F. CHUBB

Mr. Chairman and Members of the Committee: Thank you for the opportunity to meet with you to discuss the Air Force's current efforts to first control and then reduce cost growth in our weapons programs. Within Air Force Systems Command (AFSC) this has been our number one challenge. To meet this challenge we undertook an Affordable Acquisition Approach Study, or A3 as we call it, not so much to identify specific solutions to the increasing program cost problem, but to determine the primary contributors to cost growth. With these in hand we can devote management attention to their resolution. We believe that this study coupled with other management initiatives, which I'll address later, has put us on the right track towards reducing program cost growth. First, I'll discuss the A3 study as you specifically requested.

AFFORDABLE ACQUISITION APPROACH

AFSC initiated A3 to test a perception that we used to build weapon systems faster and cheaper than we do today. To establish a level of independence, we chartered the study under an Executive Steering Committee comprised of senior retired military and civilian personnel. The initial step in the study was to develop an information base. Over 600 related studies and 109 programs were reviewed in detail. Several industrial chief executive officers were also interviewed to gain industry's perspective of cost and schedule growth problems. To better focus the study, we then selected 55 programs for detailed study (including aircraft, armament, space, missile, and command, control, and communications programs). Each of these programs

was measured against a series of cost and schedule growth factors ranging across technical, funding, cost estimating, management and schedule implications.

An in-depth review of the 55 programs showed that the leading cause of program cost and schedule growth was program instability. This was manifested by several interrelated problems with funding instability, technical complexity, the impact of technical advancement, external management impacts, and technical problems being the most recurring problems. When we compared these cost and schedule growth contributors with our experience of the 50's and 60's, we found that technical problems have decreased, but external management decisions have had a larger impact, and funding problems have increased.

In assessing the increase in funding problems, we found that real budget constraints, optimistic forecasts of outyear budgets, optimistic forecasts for inflation, and real cost growth were the major contributors. We want to increase the return on our investment and consequently the capability we can buy for the budget available. Since real cost growth is the area AFSC can most directly influence, we have focused our actions to reduce cost and schedule growth.

The importance of A3 is that the study findings help better understand the primary causal factors that contribute to cost growth. As a result, even more emphasis is being placed on Project Cost and the Defense Acquisition Improvement Program. Several major initiatives within these two programs aimed at arresting cost growth and enhancing program stability are being developed within AFSC and the Air Force and I will discuss some of these next.

BASELINES

One of our principal initiatives is an effort geared towards stabilizing programs (control changes). We call this baselining. A program baseline is an up-front, formal written agreement between all involved Air Force managers which states the specific requirements to be satisfied, provides a clear definition of the program to meet these requirements, and lays out resources to be allocated for the effort. These three elements must be consistent. After all elements are consistent the baseline is approved. The approved baseline forms a contract whereby HQ USAF agrees to support through the budget cycle the necessary resources and the developer (AFSC) agrees to, in effect, a Firm Fixed Price contract with HQ USAF, and the using, supporting, testing, and training command to deliver the required product on time within cost. To change this contract requires that the change be approved at the same level within the Air Force that approved the baseline itself. We want the system to be stabilized which in turn avoids cost growth. For that reason both the initial approval and subsequent changes are placed at a high level within the Air Force. For example, on a limited number of larger programs we have vested the approval level at the Vice Chief of Staff of the Air Force, all others will be approved by the Assistant Vice Chief of Staff.

The baselining process has been initiated with selected major acquisition programs. We are also looking into the feasibility of baselining joint programs.

It is appropriate to note several areas concerning baselines. Baselining is an initiative that will take time for its benefits to be fully realized. Additionally, although the Air Force has moved out to institutionalize baselines, we are not the only player that can influence its success. For the full potential of baselines to be realized the process must be institutionalized through the total budget process.

COST ESTIMATING

A second major initiative is that of cost estimating. Two areas we are emphasizing—research and manning—are specifically aimed at enhancing our cost estimating procedures. We are increasing funding for cost analysis research. In FY 83 we had \$500K for such research; this will grow to \$2m in FY 90. At our Product Divisions in FY 93 we realigned some personnel positions to, and received additional authorizations for, cost analysis functions. In the FY 86 POM we are receiving some 30 additional authorizations for this function. We are also increasing the numbers and scope of Independent Cost Estimates (ICEs). For example, the number of ICEs in 1981 was 6 and we plan to conduct 21 in 1984.

MULTIYEAR PROCUREMENT

The Air Force has vigorously adopted Multiyear Procurements (MYP). This initiative is one of the best ways to save money and stabilize programs. Through January 1984, a total of eleven MYP contracts have been awarded with a total actual plus projected cost savings of \$2.5 Billion. In the FY 84 President's Budget, the B-1B

MYP was approved by Congress. This program represents the largest share of our total savings. We will continue to energetically support the MYP program; the FY 85 President's Budget contains three additional candidates (Defense Satellite Communications System III, F-16 Airframe and Simulator) which could save \$500 Million in program costs.

"SHOULD COST"

Increasing the use of "Should Cost" analysis principles is one initiative that offers great potential for reducing costs. It will early enhance identification of proper costs for the total contract (to include follow-on buys) and will aid the negotiation of a reasonable price for the immediate contract. This year we have selected 10 key, high dollar value programs from "Should Cost" analysis. The detailed analysis resulting from the "Should Cost" approach will yield higher confidence estimates and reduce costs.

RESPONSES OF GENERAL CHUBB TO WRITTEN QUESTIONS SUBMITTED BY SENATOR ROTH

Question 1. The GAO states in its report entitled "DOD Needs to Provide More Credible Weapon System Cost Estimates to the Congress" that cost estimates are not used as management tools to constrain cost growth and that in fact "increases in total program costs have become the accepted pattern—no one is held accountable for them." GAO recommends establishing cost estimates at the production stage which are not to exceed thresholds. Do you agree with this approach? If not, why not?

Answer. The production phase cost estimate is already used with other inputs to establish a not-to-exceed threshold. It represents a realistic, up-to-date estimated cost for the planned production program. We strive to support these production estimates in our budget submissions, because doing so results in greater stability in program execution. And, our program managers clearly understand that it is their job to maintain subsequent program costs within these estimates.

However, the production phase cost estimate should not be established as an absolute program limit. Absolute limits would largely deny the flexibility all of us need. It could preclude product improvements in response to new threats or new technologies, or schedule adjustments that promote better force mixes or encourage international negotiations. Application of an irrevocable "not-to-exceed" concept at the production decision point would constrain us to the extent that both cost and effectiveness could be adversely affected.

Question 2. Would you agree we need to reduce turnover in our management teams and improve the professional skills of our program managers?

Answer. I disagree. We can find no correlation between Air Force program manager (PM) tenure and program performance. We believe there is correlation between strong team leadership and program success. The Air Force has appropriately stressed stability and continuity in management teams, particularly through major milestones. Maintaining stability and continuity of the management team (PM, Deputy, and key functional managers) is of prime consideration in setting the length of program manager assignments.

From its inception 23 years ago, Air Force Systems Command has been particularly sensitive to building and maintaining the highest quality professional skills in our program managers. We believe we have an excellent story to tell in this area. We start from the time many of our officers are Lieutenants. We teach them in our schools, and we groom them through a succession of increasingly challenging program related and operationally oriented jobs to be program managers. We in Air Force Systems Command would welcome the opportunity to show you how the Air Force system works when you are less constrained for time.

Question 3. Don't your Services' regulations already require not-to-exceed thresholds for costs? Please be specific.

Answer. OSD, via the Secretary of Defense Decision Memorandum, establishes cost thresholds on major defense acquisitions. Further, Public Law implements the Unit Cost Report process. This establishes cost increase thresholds which, if breached, require top level DOD and Air Force determination that a program is sufficiently critical to national security, before proceeding on in spite of a cost growth. These serve the intended purpose of "not-to-exceed" thresholds by identifying the total amount of money we are prepared to spend for a program.

In parallel with these controls, and as discussed in response to question 2, we place an absolute priority on "no surprises" in the cost arena. We demand that our

program managers stay abreast of the cost status of their programs, to identify potential cost problems while we still have alternatives other than cost escalation.

Question 4. GAO says cost estimates don't constrain anything and that the budget is the major thing program managers worry about. What are cost estimates used for in the Air Force? How useful are they if they are used just for reporting purposes and not for management?

Answer. Its unfortunate that the GAO has taken such a view because, in my judgment, it simply doesn't reflect the facts. Cost estimates serve a wide variety of purposes such as establishing program cost goals and thresholds, "design to cost" goals, baselines, and program continuation decisions.

Cost estimates are a "management tool" in the broadest sense and a key ingredient in our efforts to control costs. In the early phases of a program, cost estimates are used to help define the most cost effective technical approach. Throughout the program, they are used as the basis of Air Force five year plans and budget requests. There are numerous examples where cost estimates have played a direct and substantial role in the acquisition decision process.

Cost containment and reduction—to be successful—must be undertaken as a broad based initiative in which virtually everyone in the acquisition management process participates. The program cost estimate is a key factor in pursuing this initiative, because it serves as our benchmark for measuring whether our day-to-day decisions are consistent with our objectives. Consequently, an accurate cost estimate is extremely important to us, and we are devoting maximum resources to producing better and more timely cost estimates.

Question 5. Would you agree or disagree that cost estimates are often force-fitted to agree with the overall budget targets each service is assigned every year? Isn't it true that the B-1 cost estimate was force-fitted into a target estimate, even though the Cost Analysis Improvement Group thought the actual cost of the plan would be much higher than the target estimate?

Answer. Disagree. In building our Air Force budgets, high priority is placed on maintaining stability in our ongoing programs. We expend considerable effort in assuring that we can introduce and efficiently pursue new programs within our overall budget targets. Our program offices develop cost estimates as the tools for building the budgets and we believe strongly in maintaining their integrity. We do not arbitrarily reduce a cost estimate to force-fit the budget. If, in building our Air Force budget, we find we cannot afford to conduct a new program at its proposed schedule or with its proposed content, we work with the program office to adjust the content and the schedule and then we seek viable alternatives that we can afford. If a viable alternative cannot be found, the new program is not proposed in the budget.

The B-1B cost estimate was never force-fit to agree with budget targets. The B-1B estimate was accomplished in 1981 and confirmed by Deputy Secretary of Defense (DEPSECDEF) Carlucci on 4 November 1981 at \$20.5 billion (FY 1981\$). It has remained unchanged since that date.

After the B-1B estimate was certified to the Congress by the President on 18 January 1982, the B-1B program was included in the FY 1983 President's budget and Five Year Defense Plan. The FY 1983 and FY 1984 requests were based on the estimate, and were approved (with inflation adjustments) by Congress. The estimate was not adjusted to fit the budget; on the contrary, these budgets resulted from the original estimate.

It is inaccurate to assert the Cost Analysis Improvement Group (CAIG) thought the actual cost would be much greater than the target estimate. The 1 November 1981, the CAIG report recommended a B-1B program which included full cruise missile carriage and simulators, but excluded multiyear procurement savings. It also estimated costs totalling \$4.7 billion for possible baseline program expansions and funding for program risks.

Cruise missile carriage was added to the program baseline, but the other program expansions were excluded by DEPSECDEF. The CAIG specifically recommended against funding for program cost risks. The \$20.5 billion estimate was the result.

In January 1984, the CAIG reaffirmed the estimate, and on 31 January 1984, Secretary Weinberger recertified it to the Congress.

Question 6. We have studied cost estimating problems for decades. Obviously, no one expects perfection but the GAO study indicates that plain bad management is a major factor in inadequate or poor cost estimates. Why, after all these years, are we still unable to develop well documented, consistent, and realistic cost estimates?

Answer. We believe that Air Force cost estimates are good—and getting better—because of management emphasis at all levels of the Department of Defense.

We believe the Air Force does document its estimates thoroughly. The GAO report did not identify specific deficiencies in documentation on Air Force programs. In fact, major program cost estimates—*independent estimates*—are documented and justified.

Air Force cost estimates are as realistic as we can make them. The key to realistic cost estimates is program stability. We are working hard to do what we can to stabilize our programs and would welcome the opportunity to outline for you some of these initiatives.

Question 7. Your study on Affordable Acquisition Approach states that real cost growth on the systems reviewed accounted for 16 percent of the total cost growth. Yet, you also note that the inflation associated with this "real cost growth" accounts for another 30 percent of total cost growth. Overall, you say that the "total impact of real cost growth accounts for almost one-half of the total cost growth experienced in all of these major programs." Why then is the explanation sometimes used that unanticipated inflation is in a large part responsible for cost growth?

Answer. As you point out, the Affordable Acquisition Approach (A³) study indicated that almost half of total cost growth was real growth with its associated inflation. We can and have taken steps to reduce and (hopefully) eventually eliminate real cost growth.

The impact of unanticipated inflation was also discussed in the A³ Study. A specific set of DOD inflation rates are used to create a development estimate. When these DOD rates increase to keep pace with the actual rates, the result is cost growth due to inflation. The actual rates during the time of the study were running at roughly twice the rates projected by DOD in 1976 for use in budget estimates. This unanticipated inflation alone added 14% to the original cost of the Selected Acquisition Reports programs. The high rates of inflation compounded the problems associated with quantity and real program growth as well. The much lower recent rates of inflation have already contributed to the improved cost performance of our programs.

Question 8. Please provide for the record: (1) a description of the training required of program managers, including types of skills required, length of training and percent of current program managers who have completed all required training courses; (2) average length of tenure of program managers over the last decade; (3) a listing of the tenure of program managers your services' ten largest (in budget terms) weapons programs and; (4) the percentage of program managers that are military and civilian.

Answer. (1) The Air Force recognizes that knowledge of program management procedures pertinent to development, procurement, production, and logistics support is required. Knowledge of performance characteristics, capabilities, and limitations of Air Force systems and equipment is also required.

For entry into the program management specialty, an undergraduate academic specialization in technical field, such as engineering or math, is required. This requirement has been waived on a few occasions where the individual's performance clearly demonstrated a mastery of technical management.

Completion of a resident training course at the Defense Systems Management College (DSMC) is required. Management courses taught by Air Force Institute of Technology are often accepted in substitution. This requirement may be waived if the individual has extensive prior experience and is specifically recommended by a general officer division commander.

Prospective program managers must qualify in a specialty in the Research and Development area and have 18 months experience in program office activities, including establishing requirements and programming and controlling funds, evaluating proposals, and managing development of procurement activities.

Of the 59 Air Force officers identified as fully qualified program managers and assigned to direct control of their programs, 92 percent have the required undergraduate degree. (All have bachelors degrees, 90 percent have masters degrees, and 20 percent have their Doctorates). Seventy-five percent (75%) have completed a DSMC training course. All have been selected and personally approved by the Commander, Air Force Systems Command, based on their knowledge, experience, and demonstrated performances.

(2) The average length of tenure of Air Force Systems Command (AFSC) program managers on 35 selected acquisition report programs over the last decade is 29 months.

Question 9. Please provide for the record: (1) a description of the training required of program managers, including types of skills required, length of training and percent of current program managers who have completed all required training courses; (2) average length of tenure of program managers over the last decade; (3) a list-

ing of the tenure of program managers your services' ten largest (in budget terms) weapons programs and; (4) the percentage of program managers that are military and civilian.

Answer. (3) Tenure of past program managers of the ten largest Air Force weapons programs.

Avg. all PM's last decade

F-16	42
F-15	23
B-1B.....	47
Peacekeeper.....	31
C-5B.....	15
KC-135R	20
AMRAAM.....	26
IR MAVERICK.....	27
E-3A	39
ALCM	36

(4) The program managers of 35 current and former Selected Acquisition Report programs include 33 military (94%) and two civilians (6%). When all of our FASC development/acquisition programs are considered, 65% are managed by military program managers and 35% are managed by civilian program managers.

Question 10. Is acquisition management, specifically the program manager's position, considered to be a career track in your Service?

Answer. Yes. Junior Officers may enter acquisition management through either of two tracks: Project and Program Management career field or the Engineering Management career field. They receive supervised on-the-job training in program management and are given increasing levels of responsibility for components and subsystems of weapons systems. The career progression of program managers can follow many paths, but a common trend throughout is that several assignments in a program office and demonstrated ability precede being given the overall responsibility for a program. These career fields are recognized across the Air Force for their challenges as well as their rewards. The individuals in these fields know they are working at the frontiers of technology and are justifiably proud of what they are accomplishing.

The selection of a major weapons systems program manager must be approved by the Commander, Air Force Systems Command and the program manager is accountable to him for his performance on the job.

PREPARED STATEMENT OF MAJ. GEN. JAMES F. MCCALL

Mr. Chairman and members of the committee: I am Maj. Gen. James F. McCall. I am Comptroller of the U.S. Army Materiel Development and Readiness Command (DARCOM). DARCOM is responsible for the research, development, acquisition and fielding of Army materiel. After fielding we provide sustained logistical support and depot level maintenance of this equipment. I appreciate the opportunity to address the committee on the subject of cost estimating and cost control, a subject that is of major concern to DARCOM, the Army, Congress, and the American public.

One of the most important aspects of cost control is to insure the cost estimate is accurate and complete. This requires a well educated and dedicated staff of cost analysts. DARCOM has 349 weapon systems costs analysts. They serve primarily in two categories. Small cells are located in the offices of the project managers who are responsible for specific weapon systems. Others are assigned to the cost analysis offices of our major subordinate commands which provide life cycle management to a given commodity such as aviation, missiles and vehicles. In addition 65 personnel serve as the Washington area staff for final review of the subordinate command products. This civilian workforce represents a stable resource to the Army. Cost analysts have an average age of 43, an average grade 12.5, and the majority of them are in the operations research analysis job series. They have an average 7.5 years of cost analysis experience and 43 percent have advanced degrees. Formal education is normally in the fields of engineering, mathematics, statistics, economics, accounting, and business administration or a combination of these disciplines. In addition to the formal education required of cost analysts, there are many Government schools and courses which are used to develop new people entering the field and to sharpen the skills of existing professionals. For example, within DARCOM there is a special four week course taught at the Army Logistics Management Center entitled, "Cost Analysis for Decision Making" which is oriented to the specific requirements of cost esti-

maters. We feel we have a capable and talented workforce. Although they have not always produced cost estimates that will stand the test of time, the people have not been the cause of the failure. As any number of studies have indicated, program turbulence, underfunding, inflation and other causes have been the primary causes of cost growth.

DARCOM has actively responded to the April 1981 acquisition improvement program initiatives. I have selected three of those initiatives upon which to expand. They are: (1) increased program stability, (2) use of multiyear procurement, and (3) budgeting to most likely cost.

In order to insure stability of weapon system development and production the Army has stabilized to the maximum degree possible the tour of duty of weapon system project managers. Our objective is to have them serve a minimum three year tour of duty. Many of our major systems managers have served four to five year tours. This stability is augmented by a civilian workforce in which the deputy project manager and the chief cost estimator frequently have greater tenure. As another improvement aimed at stability, DARCOM has established the program management control system (PMCS). It is admittedly designed after the program control system that Gen. Alton Slay, USAF Ret. established at the Air Force Systems Command. PMCS provides a mechanism to enforce discipline within the Army's weapon system acquisition process. It provides tight management control of programs. Program changes are only achieved by a formal signature document thus preventing undisciplined changes. There are currently 17 major systems under PMCS with 8 additional systems to be implemented this year. Each weapons system is baselined for cost, schedule, performance, quantity, production capability, and integrated logistics support requirements. Program stability is enhanced because baseline requirements can not be changed without formal approval by the Department of the Army. The systems are tracked monthly to detect deviations from their baselines. This alerts management early to trends and problems which may require active management involvement to solve the problems.

Another acquisition improvement program initiative the Army is actively pursuing is the use of multiyear procurement. It is estimated that multiyear procurement could result in a savings of five to twelve percent in unit procurement cost through economies and efficiencies in the production process. The following summarizes some of the multiyear contracts for major weapon systems. In FY 82 the Army awarded multiyear contracts for the Black Hawk Airframe and M1 Fire Control. In FY 83, the Army awarded multiyear contracts for the MLRS, T700 engine and Bradley fighting vehicle components. Additionally, congressional approval was obtained for award of the armored combat earthmover in FY 84. The FY 85 major items now before the Congress include multiyear procurements for the Black Hawk Airframe, Bradley fighting vehicle system turret drive, the Bushmaster 25mm cannon, CH-47D, 5-ton truck, and the contact maintenance shop equipment. We plan to continue to consider multiyear contracting for selected systems that have stable funding, a stable design and stable requirements.

The forth acquisition improvement program initiative I would like to discuss is budgeting to most likely cost. The basis for all weapon system cost information is the project manager's approved baseline cost estimate (BCE). The BCE is prepared in accordance with the provisions of AR 11-18 (cost analysis program) and related DA pamphlets. The BCE is a complete, detailed and fully documented estimate of the materiel system's life cycle costs. All costs are broken out by the appropriate funding category. The BCE is prepared by the project manager and is updated annually. The validity of the BCE is tested using an independent cost estimate (ICE). The ICE is prepared by a team whose membership consists of knowledgeable and capable cost analysts outside of the office of the project manager. They are from all Army command levels from the Comptroller of the Army's cost analysis office to the DARCOM subordinate commands cost analysis offices. The ADHOC independent teams allow for a truly independent and thorough evaluation of the cost estimate of the system proponent. Once the BCE is validated and approved, it becomes the Army's official estimate of the weapon system's cost. This annual BCE/ICE comparison process satisfies the requirement of the Army System Acquisition Review Council (ASARC) and the OSD cost analysis improvement group (CAIG) for an independent, second opinion of total program life cycle costs. To insure that the full amounts required by the approved estimate are included in the program and budget, the Department of the Army has established the Weapon Systems Subcommittee of the Army Program and Budget Committee. This committee insures the BCE is used as the basis for the preparation of the President's budget and five year defense plan. The BCE is annually reviewed to insure it includes all costs and the budgeting documents are reviewed to insure they align with and include all resource requirements

in the BCE. Through this process the Army insures that the PPBES budget requests track to the expected weapon system's life cycle costs.

In addition to the acquisition improvement initiatives already discussed, DARCOM has several other initiatives that will help to control costs. As you are aware, early in his tenure the Secretary of the Army convened a cost discipline advisory panel of industry experts to review our entire process. One of their recommendations was that we should invest in additional research to insure our analysts stay on the leading edge in the techniques of cost estimating. In response to these observations we have invested in cost analysis models and data bases, and methodology research. In FY 84 the Army invested \$1.1 million on cost research to improve the missile data base, the electronic data base and methodology to predict first unit production costs. Additional proposed projects for FY 84 and FY 85 amount to \$1.6 million to improve the other commodity data bases and enhance automation. DARCOM is also implementing the operational baseline cost estimate (OBCE) which will automate the BCE. The OBCE will allow the project manager to be more responsive in evaluating cost impacts of anticipated program changes, and will enable him to easily translate his estimate to other financial and cost formats such as those used in the contractual process.

In summary, the entire command structure of the Army is vitally concerned with the issue of cost control in weapon systems acquisition. The Army's cadre of cost analysts is a singular strength to insure this control. We view this cadre as a stable and valuable asset. The Army is pursuing many initiatives under the acquisition improvement program, a few of which I have outlined here. In addition we have taken our own steps to plug gaps in the system. These actions will not, in and of themselves, guarantee zero cost growth, but they will improve our ability to make and sustain credible weapons systems cost estimates.

RESPONSES OF MAJOR GENERAL MCCALL TO WRITTEN QUESTIONS SUBMITTED BY
SENATOR ROTH

Question 1. The Committee received an Army Audit Report from 1982 which states that turnover in program managers is a severe problem. The report shows that program managers averaged only two years on the four programs it analyzed. Don't you think this turnover hurts the professionalism of our acquisition managers and makes it nearly impossible to hold anyone accountable for program performance? Would you agree that we need to reduce turnover in our management teams and improve the professional skills of our program managers?

Answer. The Army agrees there is a need to reduce the turnover of program managers (PMs). For the past 10 years we have experienced a 2.5 year average tenure. Our goal is 3-5 years. We are working on ways to achieve this goal. Each PM office is augmented by a civilian workforce which includes a senior deputy PM. This civilian workforce provides management and technical continuity to our program management teams.

In the area of accountability, the PM is accountable to every audience he addresses in the decisionmaking process. New PMs research, point out, and acknowledge decisions that may have effected the program in a nonoptimum manner. The prior PM may not have made such decisions willfully. More than likely the decisions were made for him. Culpability must be shared all the way from the PM through the Congress.

To improve the professional skills of military officers responsible for activities in the materiel acquisition process the Army in November 83 established the Materiel Acquisition Management (MAM) Career program. This program establishes a more disciplined and mandatory training/selection/experience progression to insure that a pool of qualified officers will be defined, filled and certified. To continue in the program above the grade of Lieutenant Colonel, which is the entry level for program managers, an officer must have attended the 9 week MAM Course held at the US Army Logistics Management Center and the 20 week Program Managers' Course at the Defense Systems Management College. Both courses cover all aspects of acquisition management needed to broaden the skills of future PMs. It will take many years to realize the fruits of this current grooming effort.

Question 2. The GAO states in its report entitled "DOD Needs to Provide More Credible Weapons System Cost Estimates to the Congress" that cost estimates are not used as management tools to constrain cost growth and that in fact "increases in total program costs have become the accepted pattern—no one is held accountable for them". GAO recommends establishing cost estimates which are not to exceed thresholds. Do you agree with this approach? If not, why not?

Answer. The Army agrees with the concept of cost thresholds. DOD Instruction 5000.2, "Major Systems Acquisition Procedures," requires not to exceed cost thresholds for major systems. Any program in danger of breaking the threshold is reassessed. If the threshold is breached, the Defense Acquisition Executive is notified. He then decides whether or not a program review or a Defense System Acquisition Review Council is required.

Question 3. Don't service regulations already require you not to exceed thresholds for cost? Why aren't they followed?

Answer. The answer to Question 2 indicated that DOD Instruction 5000.2, "Major Systems Acquisition Procedures" requires not to exceed cost thresholds for major systems. The Army is in strict compliance with this instruction. Army regulations also contain stringent requirements that must be met in the development of weapons systems cost estimates. Included are requirements to establish Design to Cost goals and Design to Unit Production Cost goals. These goals are transcribed in the System Concept Paper and Decision Coordinating Paper for designated acquisition systems. The Program Directive Document of the Program Management Control System incorporates even more stringent cost goals to be achieved during the acquisition cycle. Within the established overall cost goals, selected threshold criteria may be established as management tools, but these are not hard and fast, "hold the line" cost criteria. When established cost thresholds are threatened, such events trigger management decisions which deal with all facts at hand at that particular point in time.

Question 4. According to GAO, some \$900 million in costs on the Bradley Fighting Vehicle were "saved" by deleting certain items which are supposedly part of the system from the cost estimate. Why was this done? Is it normal practice to constantly change the definition of what is included in a program and if it is, how can Congress get a true picture of the cost history on a weapon?

Answer. The Army deleted \$982 million from the December 1982 Bradley Fighting Vehicle SAR for product improvements which included low profile antennas, heading reference sets, drivers' thermal viewer, improved maintenance and diagnostic equipment and NBC protection equipment. For the following reasons these product improvements were deleted from the SAR. The radio equipment for which the low profile antennas were required was not available and the antennas were not needed. The heading reference set technology lagged so the item could not be made available as planned. The other items experienced developmental or producibility problems making it necessary to delete them. The change to the December 1982 SAR provided Congress with the information to insure Congress was aware of the changes to the program.

Question 5. The Committee received a study done by the Army Auditor General in 1982 on the Hellfire, Pershing II, Viper and MLRS systems. It states that the cost estimating process for these systems "was not adequate" and it goes on to say that "Program cost estimates for the Hellfire, Pershing II and Viper understated future costs of producing the systems." How can Congress have confidence in the cost data you provide when your own auditors find serious flaws in it? What has been done to improve the cost estimates on these specific systems since the issuance of this report?

Answer. The Army Auditor General's critique of these four systems resulted from a comprehensive review of 25 major systems ordered by the Under Secretary of the Army. In the case of the Pershing II and the Viper, the critique by the Auditor General was essentially valid and the estimates were changed. In the case of the Hellfire and MLRS many of the findings of the Auditor General have proved to be unwarranted.

The audit process serves as a means of identifying deficiencies and is followed up with corrective actions where warranted, in order to preclude future recurrence of such deficiencies. In this regard the Army audit of the weapon systems cost estimates identified certain problem areas which have been either corrected or eliminated based upon a better understanding of the facts. These deficiencies should therefore not be repeated in future cost estimates. The audit process has thus served as an additional Quality Control check to which cost estimates are subjected thereby instilling a greater degree of confidence in the cost estimating process.

A variety of management initiatives have been and will continue to be implemented which will serve to improve the cost estimating process. For example, the Army has implemented a control process called the "Program Management Control System (PMCS)". PMCS is designed to define program objectives, increase discipline in the materiel acquisition process, and to provide increased visibility of program trends and earlier identification of decision alternatives. PMCS will define cost baselines with an auditable track to the budget, formalize the program change process,

and require monthly status to be portrayed against a formal program baseline. In addition, the Operational Baseline Cost Estimate (BCE) concept has been developed to provide the PMO with an in-house automation capability for the maintenance of a current BCE and for the automatic computation of cost estimates in the variety of required formats. The concept also provides for the automatic restructuring of the BCE into an operational format which will considerably reduce PM cost trackability and reporting problems.

Question 6. The September 1981 program office production estimate for the APACHE helicopter excluded \$291 million, according to GAO, for combat mission stimulators and \$59 million for aircraft survivability equipment. Do you agree that these costs should have been included in that program cost estimate? If so, why were they then excluded?

Answer. The costs for combat mission simulators (CMS) were not included in the September 1981 estimate because they were funded for by a separate line item. The development and acquisition of CMS are managed by a separate Project Manager for Training Devices (PM-TRADE). The resources for PM-TRADE are funded under a separate line item. The current program baseline cost estimate includes the cost of the simulators.

In September 1981 the program estimate for aircraft survivability equipment (ASE) included only a limited number of aircraft. This was consistent with the then current TRADOC decision for deployed aircraft to be equipped with ASE. TRADOC subsequently reevaluated the threat and deployment decisions and determined that survivability equipment would be provided for all deployed aircraft. The APACHE Program Office July 1982 cost estimate was therefore revised to include \$59 million for the additional quantity of ASE.

Question 7. The December 1982 SAR reported "savings" of \$1.1 billion on the ammunition costs for the Bradley Fighting Vehicle. GAO, however, discovered that ammunition costs which had been rising on previous SARs were deleted by the Army in the 1982 SAR to show a savings. Since Congress relies in large part on the SARs for developing a budget which will ensure that weapon systems are acquired in a cost-effective manner, would you agree that such bookkeeping methods are not conducive to cost control in the Congressional budget process?

Answer. Such bookkeeping methods are not conducive to a clear display of cost. The Bradley Fighting Vehicle made the deletion in conformance to current SAR policy when other systems were introduced that fire 25mm ammunition. There was no intent to show an artificial cost savings.

Question 8. According to GAO, the Army is in the process of proceeding with a program to develop a missile seeker for its Hellfire system. A previous seeker program which reportedly cost \$1 billion was not reported in Hellfire cost estimates in the SAR, has since been terminated. Does the Army plan to report this new missile seeker under program costs for the Hellfire? If not, why?

Answer. In February 1981, the approved program for a Fire and Forget Hellfire Module was terminated. An "Improved Hellfire" program is now being considered. As envisioned at the present time this program would include an:

- Improved, faster motor;
- Improved performance warhead;
- Digital autopilot; and
- Fire and forget seeker.

If the envisioned program is approved it is estimated that the engineering development would cost approximately \$245 million. The earliest the program could be started would be in fiscal year 86. This would provide a fielded item in 1990-91. If and when such an "Improved Hellfire" program is approved and funded it will be appropriately reported.

Question 9. According to GAO, "the Army appears to be making an intense effort to improve its estimating practices . . .". However, they also note that representatives at the command and program management levels are resisting implementation of many initiatives such as TRACE (Total Risk Assessing Cost Estimate). Do you agree with GAO's analysis? What is being done to resolve the problem?

Answer. At the onset of both TRACE and TRACE for Production (TRACE-P) there was understandable reluctance on the part of the program manager to increase the cost of his program. Since its inception in 1975 the TRACE program has been successfully applied to many Army R&D programs. There was some reluctance to the TRACE-P program but it is being overcome. We are placing emphasis on insuring production cost estimates include cost for technological risk.

Question 10. Please provide for the record: (1) a description of the training required of program managers, including types of skills required, length of training and percentage of current program managers who have completed all required

training courses; (2) average length of tenure of program managers over the last decade; (3) a listing of the tenure of the program managers on your service's 10 largest (in budget terms) weapon programs and; (4) the percentage of program managers who are military and civilian.

Answer. The answers are as follows:

(1) The training required and percentage of program managers (PMs) who have completed the training is shown below:

a. Program Managers' Workshop. Course provides performance oriented problem solving and tailored training in acquisition related disciplines. Course length is 4 weeks. Executive Refresher Course, course length of 3 weeks, is considered an acceptable substitute. The 4 day Senior Acquisition Management Course is acceptable for General Officers. Percentage of PMs attending: 72%.

b. Contract Performance Measurement Course. Course provides detailed training on the Defense Cost/Schedule Control Systems Criteria. Course length is 1 week. Attendance at 20 week Program Managers' Course (PMC) satisfies requirement as subject is part of PMC curriculum. Mandatory training policy effective date for this course was 22 Feb. 84. Percentage of PM's attending: 41%.

c. As mentioned in response to Question 1, future program managers will be selected from officers in the Materiel Acquisition Management (MAM) Career Program which has positive educational requirements.

d. In addition to the above courses, PMs are selected from Army officers who have had other training pertinent to program management. This includes graduate degrees in science, engineering and/or financial management and tours of duty in research and development and/or procurement activities.

(2) The average length of tenure of PMs over the past decade is 2.5 years.

(3) The tenure of PMs for the 10 largest weapons programs is displayed in the attached table.

(4) One hundred percent of the Army PMs are military.

PM TENURE, 10 LARGEST PROGRAMS

Program	Dates ¹	Number of PM's	Average tenure (to Mar. 31, 1984)
Abrams Tank.....	July 1977 to March 1984.....	3	≈ 2.3
Patriot.....	July 1977 to March 1984.....	3	≈ 2.3
BFVS.....	July 1975 to March 1984.....	4	≈ 2.2
AAH.....	June 1976 to March 1984.....	2	≈ 3.9
Black Hawk.....	October 1976 to March 1984.....	4	≈ 1.9
SINCGARS.....	July 1975 to March 1984.....	4	≈ 2.2
MLRS.....	April 1977 to March 1984.....	5	≈ 1.4
Sargeant York.....	July 1977 to March 1984.....	2	≈ 3.3
Stinger.....	August 1977 to March 1984.....	4	≈ 1.7
CH-47.....	January 1975 to March 1984.....	4	≈ 2.3

¹ Start date is assignment date of incumbent PM on Jan. 1, 1978.

² In years.

Question 11. Is acquisition management, specifically the program manager's position, considered to be a career track in your Service?

Answer. No, the Army has not had a formal career track. The Army always had an informal career track by selecting officers as program managers (PMs) who have had experience and training in research and development and/or procurement. The Army is developing a career track using the Materiel Acquisition Management (MAM) concept to identify a pool of certified personnel to fill MAM identified positions including the PMs. The MAM concept was discussed in the answer to Question 1.

EXECUTIVE REFRESHER COURSE (ERC) IN ACQUISITION MANAGEMENT

PURPOSE

To provide an understanding of current systems acquisition policy and the environment affecting program management; review established concepts and prescribed methods for managing the system life cycle; examine new management techniques; provide an understanding of the peculiarities and challenges involved in

joint service and multinational program management; and develop an appreciation for program tailoring and management flexibility in systems acquisition.

COURSE DESCRIPTION

This 3-week executive management course is designed to provide program managers and selected senior-level managers, whose duties interface and interact with the system acquisition process, with a better understanding of the latest policies, procedures, and overall environment applicable to program management. The participants will review and discuss the many concepts and methods of program management currently in use in order to highlight the problems and difficulties being experienced and avoid or minimize their occurrence in future system management activities.

The object of this lecture/discussion course will be to cover current and future policies, practices, and techniques. Although the past will be reviewed and the future will be discussed, emphasis will be placed on the day-to-day actions, issues, and problems involved in program management. Interactions will take place between the students themselves, as well as between the students and guest lecturers from the OSD, service staffs, acquisition commands and executives from the industry.

The ERC will be organized to follow the sequential phases of system acquisition and emphasize the major decisions required by DOD directives and instructions. Within each phase, the course will focus on issues, problems, and decisions.

A listing of representative subjects devoted to each is shown below.

- Defense Systems Environment;
- Decision-Making Process;
- Defense Systems Management;
- Interaction with Higher Headquarters;
- Conceptual Phase of Defense Systems Acquisition;
- Technical Management;
- Procurement Management;
- Program Planning and Control;
- Industry Viewpoint on Systems Acquisition;
- Program Review and Analysis;
- Test and Evaluation;
- Production Management;
- Operations/Support Management;
- Policy Analysis;
- Multinational Program Management; and
- Attendee Interaction.

GUEST SPEAKER PROGRAM

Guest speakers support the instruction on a nonattribution basis. These speakers are high level managers and practitioners from DOD and the three military departments, agencies of the Federal Government, educational institutions, and the defense industry. Participants have the opportunity to address questions to guest speakers.

ADMISSION DATA

Persons eligible to attend the ERC:
 DOD personnel who have been selected to occupy:
 The position of manager of a program;
 Key positions immediately subordinate to a program manager;
 Other principal supervisory-level positions with responsibility for key decisions in a program office or in functional offices supporting program offices; or
 Higher-echelon staff positions concerned with the acquisition of defense systems.
 Selected personnel in equivalent positions from other Federal agencies and the defense industry on a space-available basis.

QUALIFYING GRADE

Grade O-6 and higher in the case of officers. GS-15 and higher in the case of civilians.

PROCEDURE FOR APPLYING FOR ADMISSION

Interested individuals in the military departments and DOD agencies may request nominations using the procedures of their departments/agencies. Defense industry applicants should contact CODSIA for instructions.

This course is also described in the Defense Management Education and Training Catalog.

SELECTION/ACCEPTANCE

An individual must be selected to attend by his/her military department or higher DOD element (or CODSIA, in the case of an individual from the defense industry).

Such individual must be accepted by DSMC.

PARTICIPANT COURSE BREAKDOWN

Eight individuals from each military department, with no specific military/civilian breakdown. Five members from defense industry and two representatives from DOD or other agencies are encouraged to participate.

SECURITY CLEARANCE

Secret clearance is required. ERC participants should have their local security of officers complete and return to DSMC the clearance-verification form that is included in participant's information packets.

CONTRACT FINANCE FOR PROGRAM MANAGERS COURSE

Location: Defense Systems Management College Building 202, Ft. Belvoir, VA 22060, Length: 1 Week

Purpose: The role which American industry plays in the systems acquisition process is often decisive to successful program management efforts. Contract Finance for Program Managers is a comprehensive one-week course designed to furnish an overall understanding of defense contractor financial motivations and constraints and how they affect management of a defense systems acquisition program from both the industry and the government point of view.

Scope: Contract Finance for Program Managers has been structured to achieve a balanced presentation of financial issues which affect the day-to-day working relationship between government and industry. The course provides participants with an overview of defense contractor financial operations and how individual elements of the process fit together. Students learn to recognize financial management issues and to articulate them in industrial concepts and terms. Most importantly, attendees enhance their ability to avoid "surprises" by participation in case studies which focus on government and industry interreactions which affect a systems acquisition program's financial status. Course content is beneficial to both general and functional management level attendees in that lecture material and case studies have been structured to encourage an interchange of ideas and techniques for problem identification and resolution in this key area of program management.

Prerequisites: Attendance is open to program managers, key members of their staff, and management-level personnel from organizations which support the systems acquisition effort (e.g. Commodity and Systems Commands, AFPRO's, NAVPRO's, DCAS, supervisors of shipbuilding offices and similar plant representative activities). Attendance is limited to officers (O-3 and above) and civilians (GS-11 and above). Individuals in equivalent positions from the defense industry may attend on a space available basis.

Caution should be exercised in the selection of personnel. The course is designed for individuals with little or no formal education in financial management. People technically skilled or competent in financial management areas should not be ordered to the course unless they are advised that CFPMC will provide them with a review and a broad overview of finance.

To attend, an individual must be selected by his military service or respective higher DOD element and accepted by DSMC.

Special information: This course replaces the Industry Financial Management Course previously offered by the College since 1974. The live-in requirement has been dropped, however, the subject matter is intense and requires considerable study outside of the classroom.

CONTRACTOR PERFORMANCE MEASUREMENT (DSMC-6) (JT)

Location: Defense Systems Management College, Building 202 Ft. Belvoir, Virginia 22060, Length: 5 Days

Purpose: To provide knowledge and understanding of Cost/Schedule Control Systems Criteria from a management viewpoint; and to examine the techniques and results of applying C/SCSC to defense system programs as a primary management tool in program management.

Scope: This course is designed to acquaint DoD managers with the organizational and managerial aspects of performance measurement. Emphasis is on DoD policies and guidance for implementation of performance measurement in the acquisition of major defense systems; criteria for contractor control systems and use of data from contractor's internal systems; responsibilities for implementing performance measurement; and the latest knowledge and experience in performance measurement implementation.

Prerequisites: This course is presented to military personnel (0-3 through 0-6), civilian personnel (GS 09-15) and industry representatives occupying positions as program and deputy program managers, intermediate managers in a program office, and selected managers in positions which interface with program offices. Individuals holding equivalent positions within other federal agencies or defense industry are encouraged to attend on a space available basis.

PROGRAM MANAGEMENT DSMC-3 (JT)

Location: Defense Systems Management College, Building 202 Fort Belvoir, Virginia 22060, Length: 138 Days

Purpose: To educate selected military and civilian personnel in effective program/project management in the DoD systems acquisitions management environment.

Scope: This course is designed for the nation's program managers and their staffs and provides a managerial perspective of what the program manager must do over time during the acquisition of major systems for DoD. This course allows middle managers to develop sound management abilities and to experience the practices and problems of program management operations. The curriculum includes acquisition policy and the systems acquisition management process, fundamentals of program management, systems and decision analysis, contract management, program funds management, program cost management, contractor financial management and control, systems engineering and logistics, production and manufacturing management, test and evaluation management, values and interpersonal strategies in management, program management decision briefings, and a system management laboratory, encompassing a series of sequentially related cases that span the acquisition life cycle of a hypothetical major weapon system giving students the opportunity to apply their knowledge throughout the course in resolving program management issues.

Prerequisites: The Program Management Course is generally restricted to military officers in grades 0-3 through 0-6, DoD civilians in grades GS-11 through GS-14, and industry personnel identified by their companies as candidates for senior management positions. These are suggested grades, and requests for exceptions will be reviewed and ruled upon by the DSMC Admissions Committee. In addition to meeting grade requirements, attendees must fall into one of the following categories:

DoD personnel who now occupy, or have been selected to occupy, intermediate management positions in program offices or functional offices supporting program offices, or in higher-echelon offices supervising program management;

DoD personnel who are promising candidates for senior positions in program management;

Persons in program management or equivalent positions within other federal agencies;

Persons in program management or equivalent positions within defense industry. Nominees must hold at least a bachelors degree. The majority of PMC students hold graduate degrees and have academic backgrounds or work experience in engineering and management.

Security Clearance: Secret.

PREPARED STATEMENT OF EVERETT PYATT

Mr. Chairman and distinguished members of the committee. I am Everett Pyatt, Principal Deputy Assistance Secretary of the Navy (Shipbuilding and Logistics).

It is my pleasure to appear before this committee to discuss Navy acquisition management successes over the last three years.

Within ten days of President Reagan's inauguration, Secretary of Defense Weinberger directed a 30-day review of the Defense Acquisition System. This review surfaced significant concerns about the rising costs of acquisitions, inefficiencies in the acquisition process, instability of acquisition programs, and the increasing time required to acquire new weapon systems. The review also identified ways of improving acquisition management through revisions in acquisition strategy, management, and accountability which are reflected in Secretary Weinberger's Defense Acquisition Improvement program initiated on 30 April 1981.

The Secretary of the Navy has fully implemented the Acquisition Improvement Program, and we are extremely proud of our accomplishments in improving Navy acquisition programs. This January, we submitted to the Congress the fourth in a series of expanded Navy budgets which are designed to achieve a combat-ready 600-ship Navy by the end of this decade. It is essential that we achieve this goal—and we will achieve it, but we recognize that we must work within limited resources.

We believe that a sound, coherent, well-managed acquisition program will help us succeed in attaining our force level and readiness goals within a limited budget. A wasteful or mismanaged program would not achieve our goals, indeed, it would be counterproductive. The Navy has designed stable and affordable acquisition programs. The keys to these programs are improvements in program stability, contracting strategy, competition, proper pricing, and management discipline and accountability.

Program stability has been achieved. The personnel, readiness, shipbuilding and aircraft procurement goals presented to the Congress in the FY 1985 Budget Request are largely unchanged from previous years. Through such stability, we will avoid the ragged pattern of past five-year plans for which we paid terribly high cost and efficiency penalties.

Our new contracting strategy has been the cornerstone of our success. Several significant revisions have been made in Navy contracting policy since we initiated our acquisition improvement program. We have exercised increased program discipline by defining our requirements more clearly and by controlling changes after contract award by requiring approval of the Secretary of the Navy and Chief of Naval Operations for any that would increase costs. This identifies, at the onset, the risks for all parties to the contract. We have also allowed more contractor participation in design of systems so that designs represent cost saving manufacturing techniques. We have moved away from cost-plus contracts to firm fixed-price and fixed-price incentive contracts for production equipment.

Most significant is the change to fixed-price incentive shipbuilding contracts with risk sharing. Under the old cost-plus contract system, the government pays for all cost growth. All shipbuilding programs now provide for equal sharing by the Navy and the contractor of cost savings or cost growth up to ceiling. Cost growth over ceiling is borne 100 percent by the contractor. Incentives of this sort are largely responsible for our considerable success in bringing ships into the Navy on time and under budget.

In 1982, 19 of 25 ships were delivered to the Navy on time or early. Of these, 7 ships were delivered a total of 11 months early and 19 were on or below budget. In 1983, only one of 21 ships was delivered late. Twelve were delivered on time, and 8 were delivered a total of 22 months ahead of schedule. Thirteen ships were delivered on or below budget. So far in 1984, of 9 ships delivered, 7 have been on time or early. Three ships have been delivered a total of 8 months ahead of schedule.

One notable example of our success is the nuclear aircraft carrier *Theodore Roosevelt* (CVN-71). The contract for this ship was modified to include an incentive clause for delivery of the ship up to 14 months in advance of the contract delivery date. This is expected to result in a net savings to the government of about \$74 million. The *Roosevelt* is now ahead of even that accelerated schedule and has a launch date in October of this year, 17 months ahead of the original schedule.

Firm fixed-price contracts are the standard in our aircraft procurement program. All aircraft acquisition contracts are now on a firm fixed-price incentive basis. These contracts have resulted in significant savings over the past few years.

In FY 1983, the President's Budget estimate for flyaway costs of combat aircraft was \$5.33 billion. Thanks to our revised contracting strategy and effective contract negotiation, we executed that budget at less than \$4.76 billion, a saving of well over 10 percent.

In the ensuing years we have continued this reduced cost trend. The F/A-18 aircraft unit price in FY 1983 was 8 percent below the FY 1982 price. The FY 1984 price is lower by two percent than the FY 1983 price. Since FY 1982, when com-

bined with increased quantity, we have reduced the unit prices of the SH-60B helicopter by 38 percent, of the AV-8B aircraft by 44 percent, and of the E-2C and CH-53E by four percent. All of these are in excess of the reductions normally expected because of the learning curve.

Multi-year, multi-unit procurement has been instrumental in some of our largest contracting successes. Procurement on a multi-year, multi-unit basis gives us program stability. It allows both the Navy and the contractor to achieve the benefits of reduced escalation resulting from earlier deliveries and the cost savings associated with economic order quantity procurement. This type of procurement avoids duplication of nonrecurring costs, improving productivity and planning for production facility and manpower utilization.

The FY 1983 multi-ship contract for the nuclear aircraft carriers *Abraham Lincoln* (CVN-72) and *George Washington* (CVN-73) is expected to result in savings to the taxpayer of over \$750 million, with a total of 44 months acceleration of delivery when compared with the Navy's "traditional" plan, which was originally based on one ship in 1984 and one in 1986. In addition to this planned saving, additional savings have occurred which could allow us to fully fund the FY 1985 increment of the *Missouri* reactivation, a saving of an additional \$410 million.

Multi-year procurement of the C-2A transport aircraft will save \$89 million, about 11 percent of the program cost. The multi-year contract for the A-6E Detection and Ranging Set will save \$78 million.

Our FY 1983-1985 multi-year procurement of MK-46 lightweight torpedoes has realized a saving of \$86 million, 15 percent of what a series of single-year contracts would have cost.

Increased and continuing emphasis on competition has also helped us to reduce acquisition costs. We have sought true competition, not merely the appearance of competition and the award of a production monopoly. The policy of the Secretary of the Navy is to establish a second source in every appropriate program.

In 1981, only 26 percent of our shipbuilding contracts were competitive. We have increased that percentage to over 86 percent—this year, at least 19 of 22 ships will be awarded competitively. At least 90 percent of new ship construction and conversion contracts in our FY 1985-1989 plan will be awarded competitively. Of the ships in that five-year plan, only the Trident submarine is anticipated to require a non-competitive award.

Contracts were signed this past December for the first three AEGIS cruisers to be competitively awarded—two to Litton and one to Bath, the new second source. The saving from the President's Budget Request in the first year of competition is projected to be at least \$228 million.

Competition has been implemented in every Navy procurement area and has helped us realize a number of successes:

A recent competition for CT-39 aircraft support is expected to yield savings of \$2.5 million.

Competition and dual sourcing have saved millions in missile procurement:

All subassemblies of the Sidewinder air-to-air missile are dual sourced; we have saved \$10.5 million on one of seven subassemblies already in FY 1984.

Four of six of the Harpoon missile subassemblies are dual sourced; \$36 million was saved on this missile in FY 1983. (An additional \$36 million was saved through value engineering changes.)

On the Phoenix air-to-air missile, \$10.8 million was saved in FY 1983; more of its components will be dual sourced in the coming years.

Navy's plan to introduce second source production for the Harm missile was not completed, but more components of the Harm anti-radiation missile are being dual sourced; the unit cost of the Harm was reduced 15.2 percent from FY 1982 to FY 1983 and another 20.6 percent from FY 1983 to FY 1984. Yesterday, we announced that we have contracted with Texas Instruments to buy 798 High Speed Anti-radiation Missiles—the Harm. Our firm adherence to fiscal responsibility has provided enough savings to buy an additional 207 missiles.

Competition for nuclear attack submarine contracts has led private submarine construction yards to achieve revolutionary breakthroughs in production technology and facilities. Improved fabrication techniques are expected to significantly shorten submarine construction times, from a previous best of 62 months to about 50 months. Increased competition in FY 1984 for SSN-688 class submarines resulted in a savings of \$108 million from the President's Budget Request.

We have successfully contested and resolved contractor assertions of proprietary rights in spare parts procurements:

Three major contractors have agreed that we may buy spare parts directly from their subcontractors and licensees.

Another contractor has agreed to provide the Navy with formerly proprietary data at no charge so that we may establish our own repair facilities for inertial navigation systems. This same contractor agreed to reduce the price of a reproducible technical data package for an inertial navigation system by \$45 million.

Still another contractor has agreed to deliver future spare parts provisioning data free of restrictive markings.

Competition has been a key to the success of our BOSS program—Buy Our Spares Smart. I will discuss the BOSS program in more detail later in this statement.

We have established a flag rank Competition Advocate General in the Office of the Secretary of the Navy and the Navy Material Command. The Competition Advocate General has very real power to get into all Navy acquisition programs and assure that we take maximum advantage of competition. In addition, over 200 command competition advocates have been established to implement competition throughout the Navy.

Competition is a powerful economic force and we have learned to use it to the best advantage of the Navy and the taxpayer. Competition has provided us with major cost reductions and significant reductions in delivery time. The supplier base is expanding because of competition and we are witnessing a burst of competitive innovation as more vendors vie for our business.

In FY 1981, about 25 percent of total navy procurement dollars were competitively awarded. A modest increase to 26.7 percent was achieved in FY 1982. In FY 1983, the total dollars awarded competitively increased 40 percent over FY 1982 to a total of \$13.2 billion. This brought our FY 1983 competition percentage up to 30.5 percent—slightly above our goal of 30 percent.

For FY 1984, we have increased our goal to 38.6 percent, more than 25 percent higher than our FY 1983 achievement. As of the end of the second quarter of FY 1984, we stood at 30.8 percent and we are confident that our FY 1984 goal can be achieved. The benefits of competition are too great to relax at this point.

We have placed increased emphasis on accurate estimation of the cost of our acquisitions. The Defense Acquisition Improvement Program mandated that we budget to most likely cost. The Navy's Independent Cost Analysis Group has been functioning to implement that direction. During both the budget development process and the acquisition review process, the program manager's and independent cost estimates are compared. The independent cost estimating group serves as a check on the validity of the program manager's cost estimate. Where significant differences between the two estimates exist, they are subjected to further analysis to ensure that the budget is properly priced.

Although a recent GAO report has charged that Navy cost estimates are optimistic, the truth is that our recent cost estimates have been high because of the more competitive marketplace for ships and major equipment in 83 and 84. For example, on the LSD-44 the first of the LSD-41 class competed on a fixed-price type contract basis, the award last November was approximately \$60M under our estimate. So charges that our cost estimates are optimistic are not valid for recent programs, and, in fact, the reverse is true.

We have established firm cost thresholds for design-to-cost on the new nuclear attack submarine and the DDG-51 guided missile destroyer. These thresholds are approved by the Secretary of the Navy and Chief of Naval Operations as are the firm development cost thresholds that we have placed on the A-6 and F-14 aircraft.

Steps are also underway to provide visibility of support funding for selected weapons systems in the budget development process. Plans are to validate the program manager's support cost estimates through review by Navy managers and cost analysis groups external to the program officers.

Under the Defense Acquisition Improvement Program, acquisition management authority has been returned to the Service Secretaries and they have taken steps to improve their ability to manage. In the Navy, we have made major organizational changes in the Naval Material Command to promote procurement competition, to improve planning, to improve cost and schedule control in industrial facilities, to decentralize management authority and, most important, to increase management discipline and accountability.

A new independent cost estimating organization has been established to advise the Secretary of the Navy, the Chief of Naval Operations, and the Chief of Naval Material on program cost estimates.

A new, simple and straightforward acquisition reporting system called the Navy Acquisition Reporting System has been established for the top 60 Navy acquisition programs. This quarterly reporting system provides senior Navy management with information on any changes in estimated research and development or production costs and provides early warning of performance difficulties.

Major project organizations are being changed to include a budget officer who will be independent of the project manager. This budget officer, who will work for the Comptroller of the Naval Material Command, will provide independent budget and cost review.

In the personnel area, we have established a new program to draft quality personnel with established professional warfare specialties into the acquisition field. We have also revised the guidance to Navy promotion boards to increase emphasis on the performance of officers in acquisition management billets. We have revised assignment policies for program managers to provide a minimum tour length of four years for stability, and we have mandated that arrival and departure from these billets coincide with major program milestones and/or program starts or completions.

We have improved the quality and increased the number of on-site personnel performing contract administration, business review, and production surveillance functions. This initiative helps provide early warning of potential problems and time to achieve solutions before cost growth or quality degradation can get out of hand.

Establishment of a firm discipline to resist the tendency to seek even greater capabilities for every system has helped control cost and reduce contract claims. By defining our requirements more carefully at the outset of an acquisition program, we have been able to control changes during production that, in the past, led to high-cost growth. When absolutely necessary, contract changes are now addressed quickly and fairly through equitable change contract clauses and procedures.

New program initiation procedures have been established which impose a much firmer discipline for the start of new programs. We must be sure of high payoff for our investment before we undertake new developments. In connection with this, we have terminated a large number of programs with low expected payoff. Most recently, we reduced Department of the Navy programs from 507 to 432 in the FY 1985 Budget Request. We are striving to achieve a target figure of 400 programs to be included in the FY 1986 budget.

This is not to say that we have restricted incorporation of high technology in our systems. In fact, investment in high technology can save money as well as increase capability. For example, the F/A-18 aircraft, because of investment in high technology, requires only about one-third of the maintenance hours per flight hour of the aircraft it replaces. This has allowed us to man each F/A-18 squadron with 50 fewer personnel than the squadrons they replace. Investment in high technology has also paid off in aviation safety. The current generation of high tech Navy fighter aircraft has a safety record twenty times better than the fighter aircraft of twenty years ago.

Clearly, prudent introduction of high technology pays off and we seek to use high technology where payoffs justify the investment. However, we have placed firm management controls on gold plating.

An issue that is receiving considerable Congressional and public attention is that of overpriced spare parts. To attack this problem, we initiated Project BOSS—Buy Our Spares Smart. Project BOSS responds to Secretary Weinberger's ten-point spare parts procurement policy initiatives with one hundred spare parts acquisition management initiatives encompassing requirements determination, spare parts breakout, spare parts competition, procurement method coding, price determination, price surveillance, and all other aspects of spare parts acquisition.

Project BOSS is an example of where investment of resources can lead to significant cost avoidances. In FY 1984, we have applied \$35.7 million and 604 people. The FY 1985 budget contains \$67.4 million and 789 people. By FY 1988, we expect to be achieving \$113 million in costs avoided and we expect that to grow to \$164 million in 1989.

Seventy-two percent of our FY 1984 BOSS budget is allocated to breakout of spare parts from the prime contractor to competitive procurement or procurement from the actual manufacturer. Breakout is the cornerstone of the project. In the first six months of FY 1984, we have broken out \$241 million worth of spare parts either to competition or to an original equipment manufacturer. Additionally, data identifying 5000 Navy-managed items which can be broken out has been received from contractors. The annual buy value of these parts is \$113 million.

Competition is important in Project BOSS. I noted before that the Navy's Competition Advocate General had achieved significant breakthroughs in reducing proprietary data rights so that we could compete spare parts procurement. In addition, our Inventory Control Points have taken steps to increase competitive procurement. Both the Ships Parts Control Center and the Aviation Supply Office are running well ahead of last year in competition percentage. The combined percentage for FY 1984 is 22 percent; in FY 1983 it was 13.5 percent.

We have obtained over \$400,000 to date in voluntary refunds from 9 suppliers of spare parts. Our PRICE FIGHTER team has been instrumental in identifying potentially overpriced parts and refund candidates. Individuals throughout the Navy have also contributed. Since the announcement last year of Secretary Weinberger's spare parts initiatives, we have rewarded 50 individuals whose actions have achieved cost avoidances of over \$3.2 million. We are putting more effort into training our personnel in cost and price analysis and small purchase procedures.

The Navy is committed to cost sensitive management, particularly in this area. Project BOSS provides the foundation for ridding our acquisition process of the overpricing problems we have discovered.

Sound acquisition management means attention to all sectors of the U.S. business base. We have, for example, placed more emphasis on the role of small and disadvantaged business in Navy contracting. Between 1980 and 1983, Navy prime awards to small business increased \$2.4 billion or 67 percent; small business set-aside was up \$1.8 billion or 175 percent; 8(a) awards were up by \$182 million or 165 percent; and women-owned business awards up by \$60 million or 130 percent. The figures for 1984 are extremely encouraging; we should easily exceed our goals. Placement of Navy work with small, minority, and women's business is not only good for the economy, it is good for the Navy. We have been very pleased with the cost and quality performance of these contractors and intend to continue to support this sector of U.S. business.

The response of industry to our acquisition management initiatives has been gratifying. There are no outstanding new construction shipbuilding claims. Contractors are aligning themselves to compete for our business; they are investing in improved plant equipment and in new technology to make their operations more competitive.

The Congress has been most supportive and encouraging in our efforts to improve our acquisition process. We now need to keep up the momentum gained and make continuing and lasting changes for the better, by focusing on achievements in cost control. We will continue to develop tight budgets and write our contracts within these budgets.

RESPONSES OF MR. PYATT TO WRITTEN QUESTIONS SUBMITTED BY SENATOR ROTH

Question 1. The Committee received a Navy report from 1981 which states that "we (the Navy) simply do not practice good business management" in acquisition programs. The report implies that turnover and lack of training for program managers is a major cause of poor acquisition management. Don't you think turnover hurts the professionalism of our acquisition managers and makes it nearly impossible to hold anyone accountable for program performance? Would you agree that we need to reduce turnover in our management teams and improve the professional skills of our program managers?

Answer. The Secretary of the Navy in this memo of 4 August 1983 reinforced the policy of minimum tour lengths of 4 years for program managers. Additionally, turnovers are to coincide with major DNSARC milestones. This policy provides ample time to provide accountability and minimizes disruptions in the programs. Most of our program managers are Navy/Marine Corps Officers with civilian deputies. The average tenure of the deputies is significantly greater than 4 years, which adds to program stability.

There is a continuing effort to improve the professional skills of our program managers. The Navy has two major initiatives in this area:

a. Starting in fiscal year 1986, all officers (LCDR-Captain) en route to a program office will be sent to the Program Management Course at the Defense Systems Management College (DSMC).

b. A Master level curriculum in Systems Acquisition Management is being developed at the Navy Postgraduate School. The first offering will be in 1985. Additionally, the recent development of courses at the DSMC such as the Program Manager Workshop should serve to improve the skills of our program managers.

Question 2. The GAO states in its report "DOD Needs to Provide More Credible Weapon System Cost Estimates to the Congress" that cost estimates are not used as management tools to constrain cost growth and that in fact "increases in total program costs have become the accepted pattern—no one is held accountable for them." GAO recommends establishing cost estimates which are not to exceed thresholds. Do you agree with this approach? If not, why not?

Answer. Cost estimates, through the annual budget, are used to constrain cost growth. A program cannot expand more than its yearly budget allocation, but this

is not the only constraint on cost growth. DOD Directive 5000.1 and DOD Instruction 5080.2 require that thresholds be established for performance, schedule, and cost. Breaching these thresholds requires a complete new DOD review of the program before determining whether to continue with its acquisition. No additional controls are needed.

Question 3. Don't your Service's regulations already require you not to exceed thresholds for costs? Why aren't they followed?

Answer. Established regulations on thresholds are being followed (see response to Q2). Where thresholds are breached, a complete DOD review of the program is required to determine whether to continue the program.

Question 4. The GAO report shows that the cost estimates on the multi-million dollar LAMPS MK III helicopter were so poorly documented and managed that GAO could not track clearly how cost estimates on the program were developed and used. How are we in Congress supposed to responsibly oversee and approve budgets for weaponry when the Navy, at least in this case, can't show us how it developed and used program cost estimates?

Answer. Documentation is available on every LAMPS estimate made by the Navy. The Navy performs many estimates a year on programs as key as LAMPS. Much of the cost estimate documentation depends on prior detailed analyses, since information available in those analyses is not repeated in later documents. Computer printouts are available for successive estimates detailing the algorithms used in their preparation. Complete documentation of the LAMPS estimate was provided to GAO at their request. The Chief of Naval Material has established guidelines for the formal documentation of cost estimates to promote greater visibility of the basis for cost estimates.

Question 5. The Committee received a Navy study entitled "Navy Acquisition Cost Study" done in 1981 by the Executive Director for Acquisition, Naval Material Command. The report reviews past studies and recommendations for improvements in the acquisition process and it states under the heading Strengthen (Navy's cost-estimating capability to provide realistic estimates that there has been "virtually no improvement" despite decades of studies and reports). Why is that in your view? Do you agree with this assessment and if not, why not?

Answer. The Navy has made significant improvements in its cost estimating capability. The Chief of Naval Material recognizes the important role that cost analysis plays in the acquisition process and has taken positive steps to upgrade this function. Increased emphasis has been placed on the technical qualifications for cost analysts and significant progress has been made in hiring and retaining qualified operations research analysts in such technical disciplines as engineering, mathematics and statistics. The cost analysis staffing within the Naval Material Command has increased by approximately 50 percent within the last 2 years. There presently are 311 assigned billets and 248 cost analysts onboard. NAVMAT Headquarters has implemented a cost analyst intern program which has been most effective in recruiting talented college graduates. A new instruction on the Naval Material Command Cost Analysis Program was implemented in May 1983. The instruction established the headquarters as the single point of technical review of cost estimates. It also disciplined the cost analysis process to produce and maintain a single documented cost analysis and estimate for every major program. Detailed guidance for formal documentation of cost estimates was issued in June 1984. The Navy costing capability has also been improved through the automation of the costing process. Development of cost estimation software/models has enabled the analyst to spend more time as true cost analysts vice number generators.

Question 6. Please provide for the record: (1) A description of the training required of program managers, including types of skills required, length of training and percentage of current program managers who have completed all required training courses; (2) average length of tenure of program managers over the last decade; (3) a listing of the tenure of the program managers on your Service's ten largest (in budget terms) weapon programs and; (4) the percentage of program managers who are military and civilian.

Answer. (1) SECNAVINST 5000.28E requires that all program managers will have training at DSMC's Program Management Course (19 weeks) or Executive Refresher Course (3 weeks), Contract Finance for Program Managers Course (1 week) and Contractor Performance Measurement Course (1 week). Tab A contains descriptions of the above courses. The single most important skill needed by a program manager is strong, technically oriented leadership. Highly competent engineers are required to understand quality of design and quality on the shop floor. Other skills needed include Financial Planning, Contracts, Production and Procurement, and ILS. 52 percent (32/62) of the Navy's program managers have completed all of the required

training courses. It should be noted that the Navy has a Weapon Systems Acquisition Management (WSAM) Program that identifies and tracks all officers that possess acquisition skills, education and experience. A yearly screening of officers ensures that we have an adequate base for assignments in our Program Offices and eventually assignments as the program manager. In addition to the yearly screening of our WSAM officers (which number about 2,500), potential program managers are selected annually by our Major Command Boards. They select officers that have the requisite education, experience and proven performance in the acquisition environment.

Consequently, while only 52 percent of our program managers have completed the short training courses at DSMC, every one of them has superior technical engineering knowledge and possesses the acquisition skills mentioned above. This is verified by the Chief of Naval Material before he approves their assignment as a program manager.

(2) The average length of tenure of the Navy's program managers over the past decade is as follows:

1974	3 yr 0 mo
1975	4 yr 0 mo
1976	4 yr 0 mo
1977	4 yr 1 mo
1978	2 yr 8 mo
1979	2 yr 4 mo
1980	4 yr 4 mo
1981	4 yr 4 mo
1982	4 yr 5 mo
1983	4 yr 1 mo

(3) Tenure of the program managers of the Navy's ten largest (in budget terms-total procurement dollars) weapon programs:

Program	PM tenure	Predecessor's tenure
(1) F/A-18	9 mo	3 yr 5 mo.
(2) Trident missile	3 yr 8 mo.	3 yr.
(3) F-14 A/D	6 mo	3 yr 6 mo.
(4) SSN-688	1 yr	4 yr.
(5) SSBN	4 yr	5 yr 10 mo.
(6) CVN	3 yr 10 mo.	6 yr 1 mo.
(7) DDG-51	9 mo	11 yr 2 mo.
(8) CG-47	9 mo	11 yr 2 mo.
(9) Amphib ships	6 yr	1 yr 1 mo.
(10) P-3A/B/C	2 yr 11 mo.	3 yr 10 mo.

(4) 95 percent (59/62) of the Navy's program managers are military and 5 percent (3/62) are civilians. These percentages are for the major programs. The remaining 350 less-than-major programs have percentages that are approximately 75 percent and 25 percent for military and civilian program managers respectively.

Question 7. Is acquisition management, specifically the program manager's position, considered to be a career track in your Service?

Answer. Yes, the program manager's position is the high point of the definitive acquisition career paths for Weapon Systems Acquisition Managers (WSAM) in the Unrestricted Line, Restricted Line and Staff Corps. Officer promotion rates for WSAMs have been notably higher through flag rank than those of their contemporaries and the position of Major Program Manager is designated as equivalent to major sea or shore command.

Chairman ROTH. The committee will now adjourn.

[Whereupon, at 12 p.m. the committee was adjourned, subject to the call of the Chair.]

ADDITIONAL MATERIAL SUBMITTED FOR THE RECORD

COMPTROLLER GENERAL'S
REPORT TO THE CONGRESS

DOD NEEDS TO PROVIDE MORE
CREDIBLE WEAPON SYSTEMS COST
ESTIMATES TO THE CONGRESS

D I G E S T

The Department of Defense's (DOD's) cost estimates for weapon systems programs are of major concern when the Congress is deciding to allocate billions of dollars to defense programs. The accuracy, completeness, and timeliness of DOD's cost estimates need to be improved to give the Congress more reliable data for its decision process.

The Congress has expressed considerable concern over the years about the effectiveness of DOD's cost estimating processes. In response to the request by the Chairman of the Senate Committee on Governmental Affairs, GAO reviewed DOD's cost estimating and reporting procedures.

GAO reviewed the DOD cost estimating process on seven selected weapon systems. GAO's sample includes three Army systems and two each from the Navy and the Air Force. While GAO's sample does not permit projection of the results servicewide or DOD-wide, GAO believes these cases illustrate the types of problems that have hampered effective cost estimating for weapon systems, and the lessons learned from these systems can serve as guidelines for improving the cost estimating process.

In the past 2 years, DOD and the services have initiated efforts to improve cost estimating and reporting. DOD's Acquisition Improvement Program includes several initiatives which, if implemented, should improve cost estimating. These initiatives address program budgeting, inflation indexes, and program restructuring. The services, especially the Army, have also begun to update guidance and improve estimating procedures. All these efforts are needed to help ensure the most effective estimating possible. (See pp. 46 to 49.)

COST ESTIMATES COULD IMPROVE WITH BETTER GUIDANCE, ASSUMPTIONS, AND METHODOLOGIES

GAO found that DOD could improve its cost estimating on the selected systems by
(1) strengthening and implementing its

GAO/NSIAD/84-70
MAY 24, 1984

guidance for estimating, (2) introducing more realism into the assumptions and methodologies used, and (3) more fully using the recommendations of DOD's independent estimating groups.

GUIDANCE

Some guidance provided in DOD and service instructions is vague and conflicting. DOD and Air Force instructions, for example, allowed differing interpretations of what costs to include in the B-1B program estimate. As a result, some estimates included the cost of flight simulators and some did not. (See pp. 8 and 9.)

Guidance must be more strictly implemented to ensure estimates are properly structured and documented and consistently developed. GAO found that in some cases not all required costs were included in the estimates and all estimates were not updated as required.

On the Army's Apache helicopter, for example, \$350 million was excluded from the production decision program cost estimate for items that should have been included under applicable guidance. Two Navy programs did not properly document estimates as required by Navy regulations. (See pp. 9 to 13.)

ASSUMPTIONS AND METHODOLOGIES

Assumptions and methodologies used to prepare estimates can greatly affect the cost outcome. Assumptions regarding program risk are one aspect GAO noted in its assessment of the selected weapon systems. By assuming low risk, costs can be held to a minimum. On the Hellfire missile program, technical engineering risks of production were considered low and estimates were prepared accordingly, and not adjusted for higher risk. GAO's January 1983 report on the program, however, pointed out higher risk associated with several significant technical shortcomings in the missile which could affect production schedules and costs. (See pp. 14 and 15.)

The treatment of inflation in estimates is another area where the assumptions used are important. DOD regulations require use of the Office of Management and Budget's (OMB's)

developed inflation rates, but some estimates used other rates. (See pp. 15 and 16.)

A frequently reported estimating problem, and one which was also illustrated by GAO's case studies, is the use of overly optimistic assumptions relating to such things as construction schedules, allowances for uncertainties, fitting the estimates to the services' budget constraints, and excluding certain relevant program costs.

While DOD instructions call for the use of realistic factors and assumptions, management's desire to keep cost estimates as low as possible sometimes led to optimistic estimates. For example, the estimate for the Apache helicopter was reduced by \$72.6 million in March 1982 to conform to fiscal year 1983 budget guidance. Estimates are kept low by using the most optimistic assumptions regarding such factors as technical risk, development and production problems, and schedule and design disruptions. (See pp. 17 to 22.)

INDEPENDENT ESTIMATES

The Office of the Secretary of Defense and the services have established independent cost estimating groups to help ensure that cost estimates are more reliable and valid. GAO found some cases in its sample in which estimates by the independent estimators were more accurate than the official DOD estimates, but the independent estimators' recommendations were not used. In one case, an independent estimate pointed out that the fire control costs for the Apache helicopter could be significantly understated. This was not incorporated into the program estimate. The next year the contractor's estimate for the fire control system rose by about \$340 million--nearly a 60-percent increase. The 1984 DOD Authorization Act now requires the Secretary of Defense to consider independent estimates and report to the Congress regarding the use of these estimates in making decisions on major acquisition programs. (See pp. 22 to 24.)

While the services should not arbitrarily accept the recommendations of the independent estimators, GAO believes that their recommendations should be thoroughly considered and if they are not used, the services should document the reasons for not accepting the independent estimates.

DOD REPORTS PROVIDED TO THE
CONGRESS NEED MORE REALISM

DOD reports its estimates to the Congress through reporting mechanisms such as the Selected Acquisition Reports (SARs), which are quarterly status reports of the cost, schedule, and performance of the major weapon systems, and the unit cost exception reports, which show when a system is in danger of exceeding unit cost thresholds established for that system. The Congress has expressed its dissatisfaction with the lack of timely and complete data in DOD's reports. The Special Panel on Defense Procurement Procedures noted in its February 12, 1982, report that:

"the SAR is inadequate in its reporting on major weapon systems to the Congress, thus inhibiting proper oversight. The SAR system does not consistently provide timely and complete information. The present SAR system provides quarterly updates that do not always reflect substantive fact-of-life changes that may have occurred in the program since the December 31 SARs." (See pp. 84 and 85.)

GAO found that while these reports provide much useful information to the Congress, DOD can improve them by expeditiously recognizing total anticipated program acquisition costs and reflecting them in the reports. For example, the TOW missile system has been a part of the Bradley Fighting Vehicle System requirements since June 1979. Costs for this missile system were known by the Bradley program office in 1982, but were not included in the SAR to the Congress until December 1983 when they were officially approved. (See pp. 38 and 39.)

The SARs also need to show the total planned acquisition objectives being considered for the weapon systems. In one case, total anticipated quantities did not appear sound; in others the quantities changed annually. For the Navy's LSD-41 ship program, for example, reports to the Congress indicated

a buy of 10 ships while internal Navy documents indicated a planned buy of 16 ships. In the case of Hellfire missiles, DOD has been purchasing about 6,000 each year and raised the total planned quantity to be purchased, reported in the SARs, by 6,000 each year. (See p. 39.)

GAO believes it is important that DOD's reports to the Congress on weapon systems include the most current and realistic estimates of program cost and status. Cost elements and quantities that are clearly anticipated to be incurred as part of the program should be disclosed as early as possible, even though they may not yet be fully approved within DOD. Such disclosure, perhaps in the form of footnotes or attachments to the SARs, would give the Congress a better idea of the complete program, and still allow DOD flexibility to change details of the program as it progresses.

RECOMMENDATIONS

GAO recommends that the Secretary of Defense improve weapon system cost estimating and reporting by (1) revising its cost estimating guidance and basic data used for estimating and ensuring stricter implementation of the guidance, (2) making fuller use of the recommendations of DOD's independent estimating groups, and (3) introducing more realism into weapon systems cost estimate reports that are provided to the Congress.

GAO's specific recommendations appear at the end of chapters 2 and 3. (See pp. 26 to 28 and 42.)

MATTERS FOR CONGRESSIONAL CONSIDERATION

GAO believes that better weapon systems cost estimates are possible and that earlier estimates of the realistic cost expectations for weapon systems can provide the Congress with a better basis on which to make resource allocation decisions among competing programs. In a recent case, the Congress and its oversight committees required the Secretary of Defense to certify the validity of DOD's cost estimates. Such certification could give the Congress greater assurance that the estimates

it receives are the most complete and realistic projections available. The Congress may want to expand this concept and require the Secretary to certify that the cost estimates which DOD provides on all major systems are prepared according to sound cost estimating guidelines and represent the full cost of the program. (See p. 42.)

DOD COMMENTS AND GAO RESPONSE

DOD reviewed a draft of this report and provided oral comments. Overall, DOD did not concur with GAO's findings and related recommendations on cost estimating and on the sufficiency of reports to the Congress. DOD was especially concerned with what appeared to DOD to be a fundamental misunderstanding by GAO of the criteria for cost estimating, budgeting, and cost reporting. DOD stated that GAO did not recognize DOD's long-standing agreements with the Congress that allow DOD to present certain costs in budget lines separate from the weapon systems budget line. DOD also stated that its criteria for cost estimating, budgeting, and cost reporting are different to meet specific needs of the congressional oversight committees.

In the draft, GAO proposed that DOD prepare new instructions for cost estimating to provide overall structure and to help ensure consistency. GAO has clarified and revised that proposal to recognize that DOD has volumes of instructions, and what is needed are improvements in that guidance, not more guidance. The examples noted in these case studies indicate that DOD cost estimates are not always complete and consistent, and GAO believes improved guidance and better implementation of it will result in better cost estimates.

DOD stated that its reports to the Congress are consistent with long-standing agreements with the congressional committees. While some of DOD's reporting procedures have been agreed to by specific congressional committees, the issues discussed in this report show that DOD's reports are still not fully meeting the Congress' needs for complete, accurate cost estimates. This view is indicated by the many

clear signals in congressional committee reports, hearings, and other sources that show dissatisfaction with the information the Congress gets from DOD on weapon systems cost estimates. This dissatisfaction has continued despite legislation attempting to achieve better reporting--attempts that include SAR reporting, Congressional Data Sheets, and the Nunn/McCurdy amendments, which established the unit cost exception reports. (See pp. 37 to 45 and app. VI item 4.)

DOD also stated that the criteria for cost estimating are different from those for budgeting and reporting. The examples drawn from GAO's selected weapon systems illustrate there are significant differences between the costs DOD estimates internally for its weapon systems, and the costs DOD budgets and reports to the Congress. While there are sometimes good reasons for such differences, these differences should be disclosed in DOD's reports and made clear to the Congress so the Congress has a better understanding of potential system costs.

PRELIMINARY INFORMATION ON PROGRAM COSTS EXCLUDED FROM
THE DECEMBER 1983 SARS (In millions of dollars)

System	Types of Costs Excluded from SARS Cost Estimates	Estimated Costs of Excluded Items
ARMY		
M-1 Tank	Production base support, development of 120 mm gun and ammunition, and development of 105 mm gun and ammunition enhancements	1,567.2
Patriot Missile	Software and spares costs	167.5
Subtotal		1,734.7
NAVY		
TACTAS	Retrofit and trainer installations	159.5
CAPTOR Torpedo	MK-46 Torpedoes	540.0
Trident I Submarine	Development for operational forces	617.1
Trident I Missile	Trident I backfit program for Poseidon submarines	3,572.5
Trident II Submarine	Backfit of Trident II missiles into Trident submarines, advance procurement in 1987 and 1988 for later ships, unspecified military construction	2,641.3
Trident II Missile	Unspecified military construction, and ballastic missile defense penetration systems	1,450.6
LCAC Landing Craft	Advanced procurement in 1989 and 1990 for later ships	36.7
SSN-688 Submarine	Advance procurement in 1988 and 1989 for later ships	980.9
CG-47 Cruiser	Combat system engineering development program and AEGIS weapons systems development	926.0
LHD-1 Assault Ship	Advance procurement in 1989 and 1990 for later ship	147.0
DDG-51 Destroyer	Advance procurement in 1989 for 1990 ships, and miscellaneous development costs	443.5
Subtotal		11,515.1
AIR FORCE		
F-15/F-16 Derivative Aircraft	Total estimated cost for the derivative fighter budget program element reported by DoD in the FY 1985 Congressional Data Sheets	3,324.6
B-1B Aircraft	Simulators, military construction, facility improvements/"Tech mod," and component improvement program	428.6
MX Missile	Development and military construction funds authorized prior to 1983, and unspecified planning and design funds	4,713.9
Subtotal		8,467.1
Total		21,716.9